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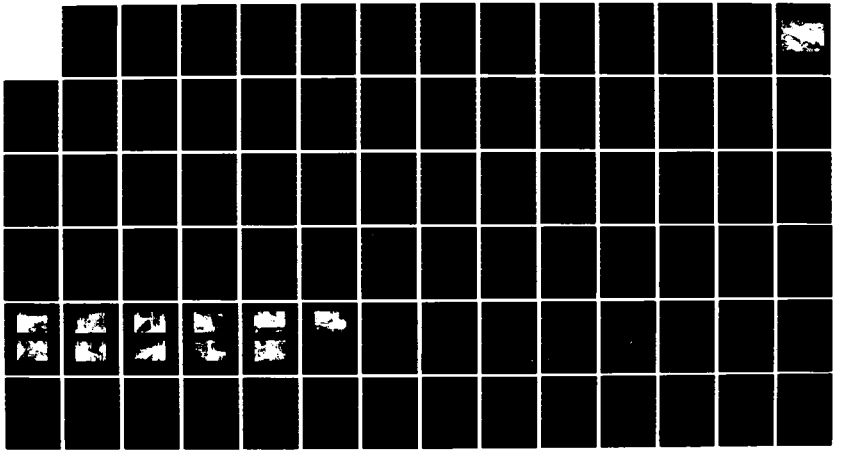

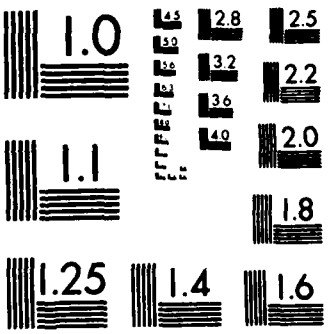

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THAMES RIVER BASIN
MONTVILLE , CONNECTICUT

CONGDON DAM
CT. 00234

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

OCTOBER, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Thames River Basin
Montville, Conn.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Congdon dam is a stone-faced earth embankment dam constructed around 1900 and was used for power and process water at a mill. The dam has a maximum height of 35 ft. and is approximately 150 feet in length (including the spillway). The dam is judged to be in FAIR condition with several maintenance items that require attention to insure the long-term performance of the structure. The dam is classified as SMALL in size and a SIGNIFICANT hazard structure. Based on the size and hazard classification the test flood for this structure ranges from the 100 year frequency event to the ½ PMF.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

MAR 06 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Congdon Dam (CT-00234) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Congdon Moving and Storage Co., Inc., 513 North Main Street, Norwich, CT 06360.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

CONGDON DAM

CT 00234

THAMES RIVER BASIN

MONTVILLE, CONNECTICUT

PHASE 1 INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 - INSPECTION REPORT

IDENTIFICATION NO:	CT 00234
NAME OF DAM:	Congdon Dam
COUNTY AND STATE:	New London, Connecticut
STREAM:	Oxoboxo Brook
DATE OF INSPECTION:	April 15, 1980

Brief Assessment

Congdon dam is a stone-faced earth embankment dam constructed around 1900 and was used for power and process water at a mill located downstream which is presently abandoned. The dam has a maximum height of 35 feet and is approximately 150 feet in length (including the spillway). The spillway is a stone masonry uncontrolled, vertical fall, sharp crested weir, 50 feet in length. There are two outlet works, one located to the right of the spillway that is a 60-inch diameter steel plate penstock which supplied water to the mill located 500 feet downstream. Both the mill and hydro-generation facilities are presently abandoned. The other outlet, located to the left of the spillway is a 30-inch square cut stone masonry outlet. Both outlets appear to have been orginally gated on the upstream side of the dam.

The assessemnt of the facility is based on the visual inspection since engineering, operational and maintenance data are not available. The dam is judged to be in FAIR condition with several maintenance items that require attention to insure the long-term performance of the structure. They include; inoperable outlet works structures, missing and dislodged masonry blocks on the downstream face of the dam, seepage along the downstream face to the right of the overflow spillway, missing mortar between the stone masonry, the lack of a scheduled inspection or maintenance program, an irregular crest surface, and trees and brush growing in the stone masonry walls, spillway and on top of the dam.

The dam is classified as SMALL in size and a SIGNIFICANT hazard structure in accordance with the recommended guidelines established by the Corps of Engineers. Based on the size and hazard classification, the test flood for this structure ranges from the 100 year frequency event to the one-half PMF. The one-half PMF was adopted as the test flood for Congdon Dam because of the potential damage downstream. Calculations indicate that the routed test flood outflow of 7,775 CFS would overtop the dam by about 4.5 feet; therefore, the spillway capacity is considered inadequate. Assuming the pool elevation at the top of the dam, the spillway can pass a flow of 1,845 CFS, which represents only 24 percent of the routed test flood outflow.

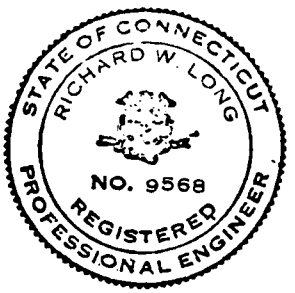
It is recommended that the Owner engage the services of an engineer experienced in the design of dams to accomplish the following: conduct further study of the hydraulic and hydrologic aspects of the drainage basin to provide alternate means of reducing the overtopping potential at the dams, evaluate and determine the cause of the dislodged and missing masonry at the downstream face of the dam and the cause of the irregular spillway crest, rehabilitate the low level outlet works to provide a means of lowering the reservoir pool for maintenance and repair.

The above recommendations and other remedial measures as described in Section 7 should be implemented by the Owner within one year after receipt of this Phase 1 Inspection Report.

CE MAGUIRE, INC.

By: Richard W. Long

Richard W. Long, P.E.
Vice President



This Phase I Inspection Report on Congdon Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase 1 Investigation is to identify expeditiously those dams which may pose hazards to human life or to property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase 1 investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain condition which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase 1 inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

The Phase 1 Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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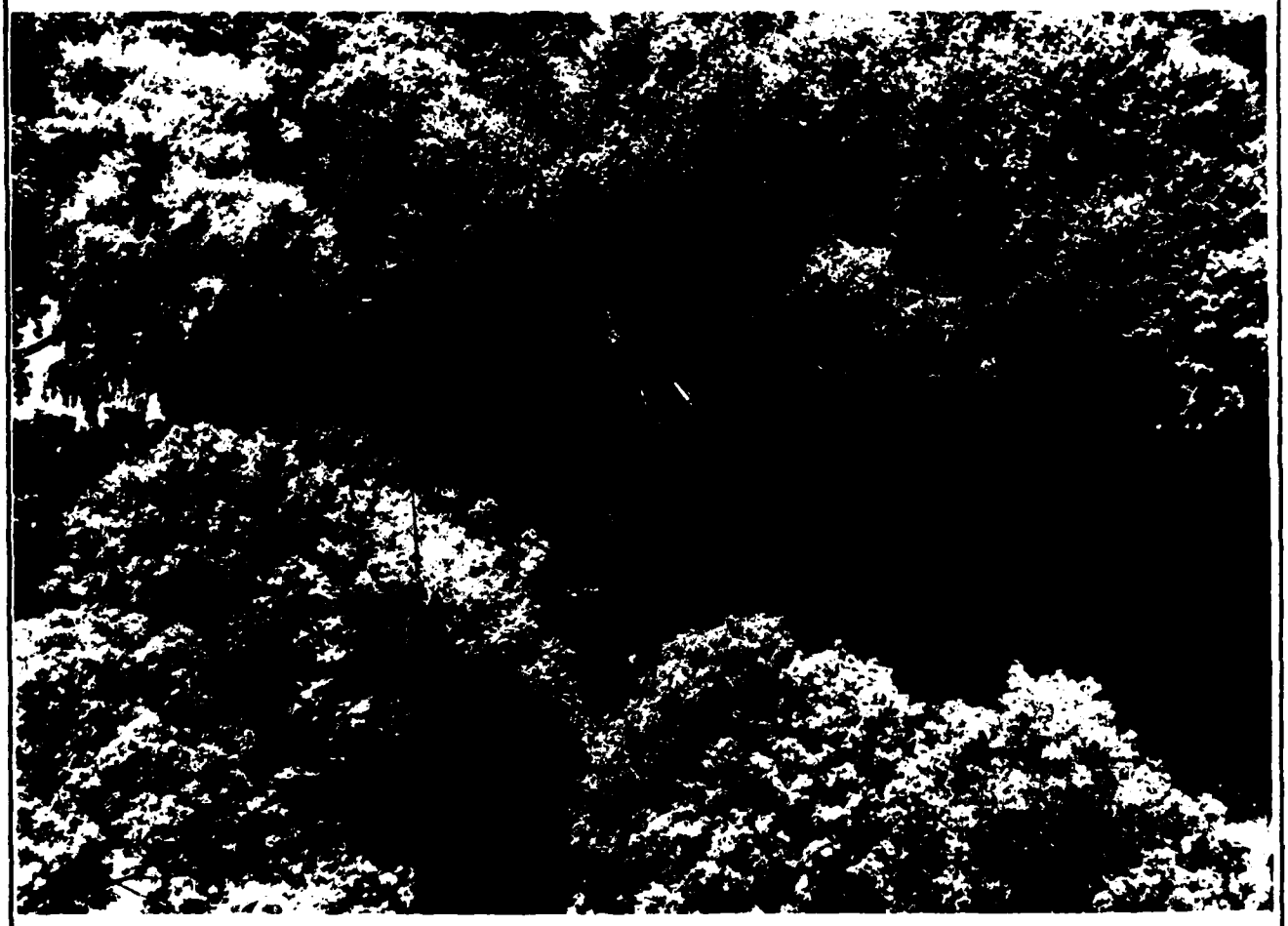
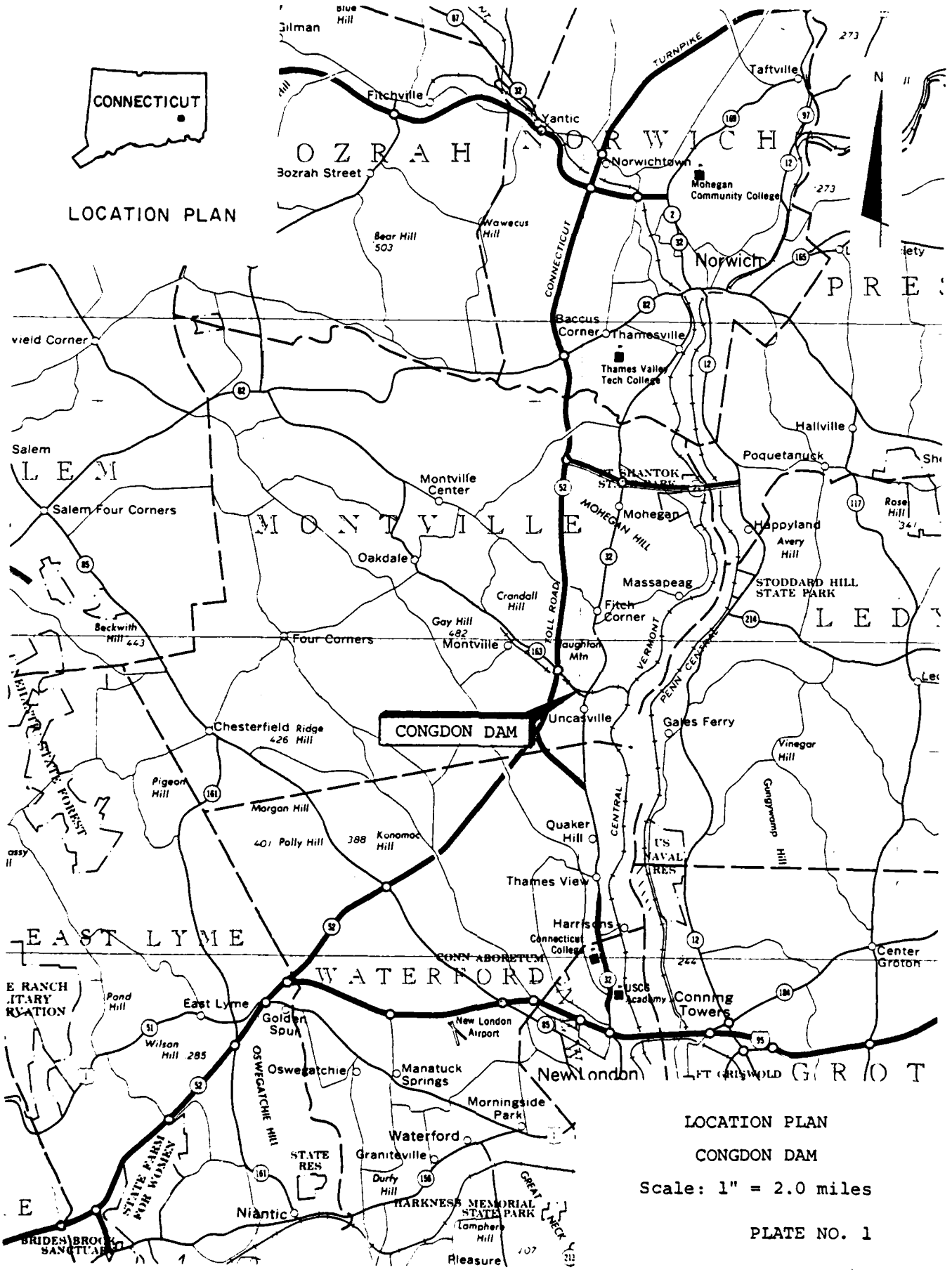


OVERVIEW PHOTO - Congdon Dam


CONNECTICUT
LOCATION PLAN
CONGDON DAM
Gilman
Fitchville
Yantic
Taftville
Norwichtown
Mohegan Community College
Bozrah Street
Bear Hill 503
Wawecus Hill
CONNECTICUT
TURNPIKE
Norwich
Baccus Corner
Thamesville
Thames Valley Tech College
Hallville
Poquetanuck
Salem
Salem Four Corners
Montville Center
Mohegan
MOHEGAN HILL
Happyland
Avery Hill
Oakdale
Massapeag
STODDARD HILL STATE PARK
Crandall Hill
TOLL ROAD
Fitch Corner
Beckwith Hill 443
Four Corners
Montville
Gay Hill 482
Haughton Mtn
VERMONT
PENN CENTRAL
Chesterfield Ridge 426 Hill
Uncasville
Gales Ferry
Vinegar Hill
Pigeon Hill
Morgan Hill
401 Polly Hill
388 Konomoc Hill
Quaker Hill
CENTRAL
US NAVAL RES
Gungywamp Hill
Thames View
Harrisons
Connecticut College
CONN ARBORETUM
Center Groton
EAST LYME
WATERFORD
Pond Hill
East Lyme
Golden Spur
New London Airport
USCG Academy
Conning Towers
Wilson Hill 285
OSWEGATCHIE HILL
Oswegatchie
Manatuck Springs
New London
Morningside Park
Waterford
STATE RES
Graniteville
Durfy Hill
Niantic
HARKNESS MEMORIAL STATE PARK
Lamphere Hill
Pleasure
GREAT NECK
LOCATION PLAN
CONGDON DAM
Scale: 1" = 2.0 miles
PLATE NO. 1

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 - INSPECTION REPORT

CONGDON DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. CE Maguire, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to CE Maguire, Inc. under a letter from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-80-C-0013 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection.

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

3. To update, verify, and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Congdon Dam is located in the southeastern part of the Town of Montville, Connecticut. The dam, located on Oxoboro Brook, is sited about one and one-half miles upstream of the confluence with the Thames River. The dam impounds water from a 10.5 square mile watershed of rolling terrain. Approximate coordinates of the dam are 41° 26.6' N Latitude and 72° 07.3' W Longtitude. The pond is aligned along a northwest-southeast axis with the dam at the southeasterly extremity of the impoundment.

b. Description of Dam and Appurtenances. The Congdon Dam consists of a stone masonry overflow spillway, and two earth embankment sections. The earth embankment sections are about 35 feet high and are faced with stone masnory on both upstream and downstream sides with the facing nearly vertical. The crest is variable in width, with the right embankment varying from 20 to 24 feet and the left from 13 to 16 feet. The total length of the dam is 150 feet including the spillway. Spillway length is 50 feet.

Two outlets are visible on the downstream face of the dam. The outlet in the left embankment is a 30 inch square conduit, and the outlet at the right embankment is a 5 feet diameter steel plate penstock. The opening through the right embankment is estimated to be 5 feet square. No control exists on either outlet at the present time and both are inoperable. The spillway crest is at elevation 99 feet above NGVD and is approximately 50 feet long. Discharges over the spillway and left embankment outlet flow into Oxoboxo Brook, at the dam. Flow through the penstock would re-enter Oxoboxo Brook at the location of the Mill buildings 500 feet downstream.

c. Size Classification. The dam is classified as SMALL in size because the maximum storage capacity, is equal to 135 Ac-Ft and the dam's maximum height is 35 feet. Both parameters place the dam in the SMALL category.

d. Hazard Classification. The dam is classified as a SIGNIFICANT hazard because it is located in a predominently suburban area where failure could result in the loss of a few lives and damage to 7-10 dwellings and 1-3 commercial properties. Flooding and potential damage may also occur to Darrow Road as well as those public utilities within the rights of way. Damage may also occur to a double barrelled concrete arch bridge located 260 feet downstream from the dam. Total water depths due to the dam failure discharge of 9850 CFS are estimated to range from 11 to 15 feet for a distance of 1,500 feet from the dam. The depths of flow downstream from the dam, before and after dam failure are 4.0 and 15.0 feet for respective discharges of 1845 CFS and 9845 CFS. The failure will cause flooding conditions downstream and high velocities of flow which will carry trees, vegetation and other debris that will increase the damage potential. Increased depth in impacted area causing damage due to failure of dam will be approximately 7.0 feet and there will be 1-2 feet of water in impacted dwellings and commercial properties.

e. Ownership. The dam is presently owned by the Congdon Moving and Storage Co. Inc., 513 North Main Street, Norwich, Connecticut. Phone (203) 889-8467.

f. Operator. Operation is at the direction of the Owner.

g. Purpose of Dam. The dam was formerly used to store water for industrial use. At the present time the water is not utilized for that purpose. Limited recreation at the damsite does occur.

h. Design and Construction History. The dam was probably built prior to 1900. No contruction history or record of subsequent modifications is available.

i. Normal Operating Procedure. The reservoir is unregulated and all downstream flows result from flow over the uncontrolled spillway.

1.3 Pertinent Data

a. Drainage Area. The Congdon Dam drainage basin is elongated in shape with a length of 7.2 miles, a width of 2.1 miles and a total drainage area of 10.5 square miles (See Appendix D for the basin map). Approximately 10 percent of the basin is swampy or occuppied by water storage reservoirs. The topography consists of rolling terrain with elevations ranging from a high of 602 feet at Raymond Hill to 99 feet at the spillway crest. Basin slopes range from 0.03 to 0.04 feet per feet and are considered flat to moderate.

b. Discharge at Damsite. There are no discharge records available for this dam. Calculated discharge data for the dam is listed below.

1.	Outlet Works:	
	Conduit size	2' x 2' Stone Masonry invert Elevation 89.5 feet
	i. Discharge capacity	56 CFS at spillway crest Elevation 99 feet
	ii. Discharge capacity	72 CFS at top of dam Elevation 104 feet
	iii. Discharge capacity	84 CFS at test flood Elevation 108.5 feet
2.	Maximum known flood at damsite	Unknown
3.	Ungated spillway capacity at top of dam	1,845 CFS

4.	Ungated spillway capacity at test flood elevation	4830 CFS (assume no over-topping of dam)
5.	Gated spillway capacity at normal pool elevation	N/A
6.	Gated spillway capacity at test flood elevation	N/A
7.	Total spillway capacity at test flood elevation	4830 CFS (assume no over-topping)
8.	Total project discharge at top of dam	1,920 CFS
9.	Total project discharge at test flood elevation	7,860 CFS

c. Elevations (Feet above NGVD)

1.	Streambed at toe of dam	69
2.	Bottom of cutoff	Unknown
3.	Maximum tailwater	Unknown
4.	Recreation pool	N/A
5.	Full flood control pool	N/A
6.	Spillway crest (ungated)	99
7.	Design discharge (original	Unknown design)
8.	Top of dam	104
9.	Test Flood level	108.5

d. Reservoir Length (in feet)

1.	Normal pool	1,000
2.	Flood control pool	N/A
3.	Spillway crest pool	1,000
4.	Top of dam	1,000
5.	Test Flood pool	1,000

e.	Storage (acre-feet)	
1.	Normal pool	100
2.	Flood control pool	N/A
3.	Spillway crest	100
4.	Top of dam	135
5.	Test flood pool	167
f.	Reservoir Surface Area (Acres)	
1.	Normal pool	7
2.	Flood control pool	N/A
3.	Spillway crest	7
4.	Test flood	7
5.	Top of dam	7
g.	Dam	
1.	Type	Earth embankment with stone facing
2.	Length (including 50.0 feet spillway).	150 feet
3.	Height	35 feet
4.	Top width	Right embankment 20-24 feet Left embankment 13-16 feet
5.	Side slopes	Vertical
6.	Zoning	Unknown
7.	Impervious core	Unknown
8.	Cutoff	Unknown
9.	Grout curtain	Unknown
10.	Other	-----
h.	Diversion and Regulating Tunnel	N/A

i. Spillway

1.	Type	Free overflow, sharp crested, uncontrolled, vertical fall.
2.	Length of weir	50 feet
3.	Crest elevation	99
4.	Gates	None
5.	U/S Channel	Natural bed of Reservoir
6.	D/S Channel	Oxoboxo Brook
7.	General	-----

j. Regulating Outlet (left embankment)

Refer to Paragraph 1.2b "Description of Dam and Appurtenances" Page 1-2 for description of outlet works.

1.	Downstream invert	89.5 feet
2.	Size	2 ft. x 2 ft. rectangular
3.	Description	Stone masonry
4.	Control Mechanism	None, upstream opening is buried by accumulated sediments.
5.	Other	-----

Regulating Outlet (right embankment)

Refer to Paragraph 1.2b "Description of Dam and Appurtenances" Page 1-2 for description of outlet works.

1.	Downstream invert	91.1 feet at downstream face of dam
2.	Size	5 foot diameter

3.	Description	Riveted steel plate penstock pipe on cradles leads to abandoned mill.
4.	Control Mechanism	Gate mechanism deteriorated overgrown and inoperable.
5.	Other	-----

SECTION 2

ENGINEERING DATA

2.1 Design Data

The following documents which contain the principal information available for this dam and its appurtenances were reviewed in the preparation of this report.

1. Plan of the "Pequot Mill Property at Montville, Connecticut owned by the J.B. Martin Co." prepared by Chandler and Palmer, Engineers, Norwich, Connecticut, dated 1919.

2.2 Construction Data

No record of construction or subsequent repair is available for this dam.

2.3 Operation Data

No record of operation for this facility is available.

2.4 Evaluation of Data

a. Availability. The information noted above was available from the Owner, at the warehouse located at the damsite Congdon Moving and Storage Co. Inc., Oakdale Road, Rt 163 Montville, Connecticut 06353.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance and sound engineering judgement.

c. Validity. The validity of the limited data available must be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase 1 Inspection of the Congdon Dam was performed on April 15 and 17, 1980, by representatives of CE Maguire, Inc. and Geotechnical Engineers, Inc. A visual checklist and photographic record of that inspection have been included in Appendix A and C, respectively, of this report. Based on the visual inspection, limited history and general appearance, the dam and its appurtenances are judged to be in FAIR condition.

b. Dam. The dam is about 150 ft. long and about 35 ft. high and is an earth embankment structure with both upstream and downstream masonry faces. A 50 ft. spillway is located in the center of the dam and an outlet works structure passes through the dam about 12 ft. right of the spillway training wall.

1. Crest

The crest of the dam is about 13 ft. wide, left of the spillway, and varies from 21 to 24 ft. wide at the right of the spillway. Trees and brush are growing on the crest. The largest tree is about 12 inches in diameter and located near the left abutment. The ground surface of the crest is very irregular. A depression about 2 ft. long by 4 ft. in size and about 8 in. deep is located on the crest adjacent to the upstream face of the dam, next to the left spillway training wall. Several depressions are located on the crest of the dam at the right of the spillway.

2. Upstream Face

Only the upper 4 ft. of the upstream face was visible at the time of the inspection. The major portion of the stone masonry forming the upstream face does not appear to be mortared, however, there are a few areas where patches of mortar are present. It is unknown if all of the masonry was mortared at the time of the original construction. Trees up to 6 inches in diameter are growing out of the upstream face at the right of the spillway, (Photos C-2 & C-7). Brush is growing out of the upstream face on both sides of the spillway. (Photo C-1).

3. Downstream Face and Toe

The masonry forming the downstream face of the dam does not appear to be mortared, however, a sandy filling between many blocks may be the weathered by-product of mortar.

a. Left of Spillway. The downstream face of the dam at the left of the spillway is shown in Photos C-3 & C-5. An abandoned outlet is located at the toe of the wall where the ground surface is locally depressed. There is a missing stone block at the toe of the wall; the cavity is about 32 in. by 15 in. in size and about 15 in. deep. No seepage was observed at that location.

Trees are growing adjacent to the downstream face, the largest having a diameter of 12 in. and is located about 10 ft. from the left spillway training wall, (Photos C-5 & C-9). Rock outcrops are numerous (Photo C-6) downstream of the dam at the left of the spillway (Photo C-6). A seep is located at these outcrops about 33 ft. downstream from the dam (Photo C-10). All seepage flows were clear. A low area exists at the left abutment of the dam (See Photo C-11).

b. Right of Spillway. The downstream face of the dam at the right of the spillway is shown in Photo C-4. A steel penstock forming part of the outlet works is located on the left side of the wall (Photo C-8). The stone blocks below the penstock have been displaced. The bottom two rows of stonework in this area have moved down about 6 to 12 in. and have also moved out, toward the downstream direction. Seepage was observed at the intersection of the downstream face and the right spillway training wall. Seepage was also observed on the right side of the penstock attachment plate. Seepage from both locations appeared to be clear (Photo C-8). A missing stone has created a gap in the downstream face about 12 in. by 12 in. in size and about 14 in. deep. The gap is located about 3.5 ft above the downstream toe. A rod could be placed 2.5 ft into a nearby joint between stone blocks. Several large trees are growing at the downstream toe of the dam. The largest has a diameter of 21 in. and is located at the right side of the downstream face. Several trees are growing between the penstock and right spillway training wall which could lead to instability of the training wall (Photo C-9). Rock outcrops were observed downstream of the dam at the right of the spillway (Photo C-6, right side).

c. Appurtenant Structures

1. Spillway

Water was flowing over the spillway at the time of the inspection and it was not possible to inspect properly the

spillway structure. There is a missing stone block in the left training wall of the spillway at the crest.

2. Outlet Works

The intake gate and penstock outlet are located in the dam embankment to the right of the spillway. At the present time these facilities are inoperable. The intake gate is filled with tree growth and the timber portions have largely rotted away. The operating stem is visible among the trees and brush in Photo C-7.

The steel plate penstock is shown in Photos C-6, C-8 and C-9. The timber portions of the connection between the steel plate pipe and the face of the dam are decayed and rotted away leaving a large void at the top of the pipe (See Photo C-9).

A drawing provided by the Owner indicates that a gate was installed on the upstream side of the left embankment. No evidence could be found in the field indicating such a gate. An opening in the base of the left embankment on the downstream side was found which could have been the outlet for this gate. No observable flow was from this opening. Both gate locations had accumulations of sediment. The upstream opening in the left embankment is completely buried.

d. Reservoir Area

No specific detrimental features in the reservoir area were observed during the visual inspection. The slopes of the shoreline are covered with vegetation which helps prevent sloughing of shoreline soils. Because of the dense vegetation around the periphery of the reservoir and upstream banks, floating debris could restrict flow over the spillway and therefore should be checked on a regular basis.

e. Downstream Channel

The channel below Congdon Dam is shown in Photo C-6. Dense tree growth is evident along the banks which are confined by vertical stone masonry walls at many locations. The outlet penstock crosses the brook several hundred feet downstream of the dam as shown in Photo C-6. Refer to the plan in Appendix B-3 for the locations of pertinent features.

3.2 Evaluation

Based on the visual observations, the dam appears to be in FAIR condition. The following features could adversely affect the future performance of the dam.

a. Displaced and missing stones on the downstream face and spillway training walls of the dam.

b. Seepage through the dam which could lead to erosion of the internal soil materials of the dam.

c. Trees growing through the upstream face, crest, and downstream toe area which could be uprooted during a storm and cause erosion and instability of the dam. In addition, the tree roots could form seepage paths through the dam which could become "piping" outlets for seepage.

d. The outlet gates are in extreme disrepair.

e. The penstock is severely deteriorated.

f. The irregular surface and depressions in the crest which may be the result of distress of the dam.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operation Procedures

a. General. The outlet works are inoperable. All discharges flow over the spillway crest to Oxoboxo Brook.

b. Description of Any Warning System in Effect. There is no warning system in effect for Congdon Dam.

4.2 Maintenance Procedures

a. General. The dam and appurtenances are not maintained.

b. Operating Facilities. There are no operating facilities at the dam.

4.3 Evaluation

The facility is not properly maintained, monitored or regulated by the Owner. The outlet works is inoperative due to decay of the gate structure. The penstock is decayed at the juncture with the dam. One outlet is not visible due to sedimentation in the reservoir.

Vegetation in the form of trees and brush is present over both embankments.

Based on the foregoing deficiencies which are apparently the result of unattended maintenance the Owner should permanently drain the pool or implement a program of rehabilitation for the facility.

If the dam is to be restored, once the embankments and outlet works have been repaired, the Owner should provide those responsible for the operation of the dam with a manual that outlines regular maintenance, inspection and operations procedures.

An emergency action plan should also be developed and implemented that includes reservoir dewatering procedures, locations of emergency equipment, materials or manpower to reduce or minimize dam failure damage, authorities to be contacted in emergency situations and a program of surveillance during unusual storm events.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General. Congdon Dam, constructed prior to 1900, is located on Oxoboxo Brook in the Thames River drainage basin in Connecticut. This reservoir has a gross drainage area of 10.5 square miles and is located 1,500 feet upstream from Connecticut, Route 52. Basin characteristics of this watershed include flat to moderate slopes with approximately 10% of the basin area covered by natural storages and swamps. There are no gaging stations located in or near this watershed. The reservoir has a small storage capacity of 100 Ac-Ft. a small surface area of 7.0 acres at the spillway crest elevation and a maximum spillway capacity of 1,845 CFS.

This dam has a spillway length of 50 feet and a surcharge height of 5.0 feet. The total length of the dam is 150 feet. The reservoir has a total storage capacity at the spillway crest level of 100 Ac-Ft and can accomodate 0.18 inches of runoff from the watershed. Each foot of depth in the reservoir above spillway level can accommodate 7.0 Ac-Ft. of water equivalent to 0.012 inches of runoff.

It will require approximately 1.5 hours to lower the pool one foot using the outlet works. For the total storage to be drained through the outlet it will require about 2 days. Because one foot of depth in the reservoir at the spillway crest is equal to 0.012 inches of runoff from the watershed it is estimated that overtopping of the dam by the test flood cannot be eliminated by lowering the pool level prior to storm flow.

5.2 Design Data. No specific design data is available for the watershed or structures of Congdon Dam. In lieu of existing design information, U.S.G.S. Topographic Maps (Scale 1" = 2,000') were utilized to develop hydrologic parameters such as drainage areas, reservoir surface areas, basin slopes, time of concentration and other runoff characteristics. Elevation - storage relationships for the reservoir were approximated. Surcharge storage was computed assuming that the surface area remained constant above the spillway crest. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual field inspection. Test flood inflow/outflow values and dam failure profiles were determined in accordance with the Corps of Engineers guidelines. Final values in this report are approximate and are no substitiute for actual detailed analysis.

5.3 Experience Data. No historical data for recorded discharges or water surface elevations is available for this dam.

5.4 Test Flood Analysis. Recommended guidelines for the Safety Inspection of Dams by the Corps of Engineers were used for selection of the Test Flood. This dam is classified under those guidelines as a SIGNIFICANT hazard and SMALL in size. Guidelines indicate that a

100 year event to one-half PMF be used as a range of test floods for such a classification. The watershed has a total drainage area of 10.5 sq. miles, 10% of which is swampy or covered by natural storages. This drainage area is largely wooded and hilly with rolling terrain. The basin slopes average 0.03 feet per feet which are considered moderate. A test flood equal to one half PMF for this dam which is on high side of small classification was calculated to be 750 CSM, equal to 7,875 CFS and was adopted for this analysis because of the large potential downstream damages. Outflow discharges were also developed using the Corps of Engineers criteria for approximate routing procedures. The routed outflow discharge for the test flood inflow was 7,775 CFS with outlets closed. The spillway and outlet rating curves are illustrated in Appendix D. Flood routings were performed assuming an initial reservoir pool at the spillway crest level with a uniform dam crest elevation of 104.0 Calculations indicate the spillway capacity is hydraulically inadequate to pass the routed test flood outflow and this flow will overtop the dam by approximately 4.5 ft. At a local depression on the dam crest as shown in Appendix C, this overtopping depth could be in the range of 6.5 feet. Outflow discharge over local depressions was considered negligible. The maximum outflow capacity of the spillway, without overtopping the dam is 1,845 CFS which is 24% of the routed test flood overflow discharge.

5.5 Dam Failure Analysis. An instantaneous full depth - partial width breach of 23 feet was assumed to have occurred in the dam. This adopted breach width of 23.0 feet was based on visual inspection of downstream topographic features. The calculated dam failure discharge of 9,845 CFS presumes the reservoir level was at the top of the dam before failure and will result in water surface elevations of 84 feet immediately below the dam (about 11.0 feet above the depth just prior to failure). The estimated damage reach extends downstream for a distance of 1,500 feet. Failure of this structure could result in the loss of a few lives, inundation of 7-10 dwellings and 1-3 commercial properties, substantial erosion along the streambed and potential damage to Darrow Road. It is estimated that the depth of water at the inundated dwellings and commercial properties could range from 1-2 feet from the dam failure flow. Utility service within the rights of way may also be temporarily disrupted.

It is estimated that the failure discharge will travel downstream through the Oxoboxo Brook streambed with high velocities. Water depths from the dam failure flow may range from 11.0 to 15.0 feet for a distance of 1,500 feet. Depths of flows downstream of dam before and after failure are 4.0 and 15.0 feet for respective discharges of 1845 and 9845 CFS. No damage except some minor flooding conditions is anticipated beyond 1500 feet. The high wave velocity will cause erosion and undermining of foundations. Discharge from the outlet structure is excluded from the total failure discharge computations assuming them to be inoperable and/or insignificant. Because of the above analysis, Congdon Dam is judged to be a SIGNIFICANT hazard structure.

CONGDON DAM

Inflow, Outflow and Surcharge Data

FLOOD	24-HOUR TOTAL RAINFALL IN INCHES	24-HOUR* RUNOFF IN INCHES	MAXIMUM INFLOW IN CFS	MAXIMUM** OUTFLOW IN CFS	SURCHARGE HEIGHT IN FEET	SURCHARGE STORAGE ELEVATION
½ PMF	11.9	9.5	7,785	7,775	9.5	109.50

= TEST FLOOD

*Infiltration assumed as 0.1"/hour
**Lake assumed initially full at spillway crest elevation 100.0 (top of dam = 104.0)

NOTES:

1. "Test Flood" computation based on COE guidelines.
2. The maximum capacity of the spillway without overtopping the top of the dam elevation (104.0) is equal to 1845 CFS.
3. All discharges indicated are dependent upon the continued integrity of upstream storage reservoirs.
4. Surcharge storage is assumed to overtop the dam when exceeding the spillway capacity.
5. Test flood = Half PMF = 750 CSM = 7,875 CFS (D.A. = 10.5 sq. miles).

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual examination of the dam indicated the following structural problems:

a. The presence of missing and dislodged stone blocks on the downstream face below the steel penstock and at other locations on the downstream face. This condition can lead to structural instability of the downstream wall.

b. The missing and displaced stones along the spillway training walls can lead to a structural instability of the spillway training wall.

c. Seepage through the dam could result in internal erosion of the dam.

d. The presence of trees and large root systems adjacent to the upstream face, on the crest and adjacent to the downstream toe, may result in displacement of the masonry and could develop seepage paths through the dam.

e. The irregular surface of the crest may be the result of internal erosion or distress of the dam.

6.2 Design and Construction Data

No design or construction records are available.

6.3 Post-Construction Changes

There are no known post-construction changes to the dam.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and, in accordance with recommended Phase 1 guidelines, does not warrant seismic stability analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based on the visual inspection and review of available data, the dam is judged to be in FAIR condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based on the visual inspection.

c. Urgency. The recommendations and remedial measures described below should be implemented within one year after receipt of this Phase 1 inspection report by the Owner.

7.2 Recommendations

The following items should be carried out under the direction of a qualified registered engineer and any recommendations resulting should be implemented by the Owner.

a. The maximum discharge capacity of the dam is not considered adequate. Further hydrologic studies are necessary to determine alternative measures to increase the discharge capabilities at the dam and reduce the overtopping potential.

b. Investigate the cause of missing and dislodged masonry on the downstream face, especially below the penstock, and recommend appropriate corrective measures.

c. Investigate the cause of seepage through the downstream face of the dam, right of the spillway and recommend measures for monitoring the seepage.

d. Remove trees and root systems growing on the upstream face crest, and downstream toe area of the dam. The resulting cavities should be backfilled with appropriate material.

e. Investigate the cause of the irregular surface of the crest and recommend appropriate corrective measures to bring the crest of the dam up to grade.

f. Investigate the necessity for pointing up the stone blocks and make appropriate recommendations.

g. Inspect and evaluate the spillway when there is no flow over the spillway.

h. Rehabilitate, repair, and make operable the outlet works.

7.3 Remedial Measures

a. Operation and Maintenance Procedures.

1. Develop an "Emergency Action Plan" that will include an effective preplanned downstream warning system, locations of emergency equipment, materials and manpower, authorities to contact and potential areas that require evacuation.

2. Maintain clearance of brush and trees on the upstream face, crest, downstream face, and downstream toe area of the dam.

3. Institute a program of annual technical inspection by a qualified registered engineer.

4. Implement and institute a program to clear and rehabilitate the spillway discharge channel of vegetation.

5. Develop a system for the recording of data with regard to items such as: water levels, discharges, time and drawdown to assist those responsible for the monitoring of the structure.

6. Implement a regular maintenance program for the facility.

7. Investigate the condition of all outlet valves and rehabilitate as necessary.

8. Provide a low-level outlet for emergency and maintenance use.

9. Provide surveillance during and immediately after high intensity rainfall.

7.4 Alternatives

As an alternative to the above recommendations and remedial measures, the Owner should consider removing the dam.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Congdon Dam

DATE April 15 & 17, 1980

TIME P.M.

WEATHER Fair

W.S.ELEV. 99.5 U.S. 69.7 D.S.

PARTY:

1. R. Brown, CEM Civil
2. E. Dessert, CEM Civil
3. S. Khanna, CEM Hydrology & Hydraulics
4. R. Murdock, GEI Geotechnical
5. T. Keller, GEI Geotechnical
6.
7.
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	99.0
Current Pool Elevation	99.5
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed.
Movement or Settlement of Crest	Crest has irregular surface; several depressions in the crest were observed.
Lateral Movement	Stone blocks on downstream face below penstock have moved laterally downstream.
Vertical Alignment	Tops of stone walls appear visually aligned.
Horizontal Alignment	Tops of stone walls appear visually aligned.
Condition at Abutment and at Concrete Structures	Small depression at contact of crest and right abutment.
Trespassing on Slopes	None of significance observed.
Sloughing or Erosion of Slopes or Abutments	None of significance observed.
Unusual Movement or Cracking at or Near Toe	Stone blocks below penstock are displaced.
Unusual Embankment or Downstream Seepage	Seepage at intersection of downstream face and right spillway training wall and to right of penstock.
Piping or Boils	None observed.
Foundation Drainage Features	None known.

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT (Cont.)	
Toe Drains	None Known.
Instrumentation System	None known.
Vegetation	Brush and trees through upstream face, crest and downstream toe.

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Approach is directly from river.
Slope Conditions	Not observable.
Bottom Conditions	Not observable.
Rock Slides or Falls	None
Log Boom	None
Debris	None observed.
Condition of Concrete Lining	None
Drains or Weep Holes	None
b. Intake Structure	
Condition of Brick Masonry and Timber	Poor. Timber portions of intake are rotted, brickwork is crumbling and trees are growing from structure.

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Poor
Condition of Joints	Not observable.
Spalling	Brickwork is crumbling.
Visible Reinforcing	None
Cracks	Not observable.
Rusting or Corrosion of Steel	Considerable.
b. Mechanical and Electrical	
Service Gates	Gate could not be observed. Much silt has occurred in front of gate. Gate is inoperable.

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Not observable.

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	Outlet channel consists of a riveted steel plate circular conduit 5 feet in diameter.
Rust	Yes
Erosion or Cavitation	Not observable.
Any Seepage or Efflorescence	Yes
Drain Holes	None observed.
Channel	Timber frame which connects stone masonry of dam with steel penstock is rotted away. The penstock discharges to a channel several hundred feet downstream of the dam. This channel was not inspected.

PERIODIC INSPECTION CHECKLIST

PROJECT Congdon Dam DATE April 15 & 17, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Oxoboxo Brook.
General Condition	Clear, unobstructed.
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Yes
Floor of Approach Channel	Natural riverbed.
b. Weir and Training Walls	Unmortared stone masonry.
General Condition of Stone Masonry	Fair
Spalling	Some stonework appears to be dislodged or collapsed around base of the weir structure.
Any Seepage or Efflorescence	Not observable due to flows over spillway crest.
Drain Holes	Not observable.
c. Discharge Channel	Oxoboxo Brook
General Condition	Fair
Loose Rock Overhanging Channel	Some
Trees Overhanging Channel	Many
Floor of Channel	Gravel, cobbles, boulders.
Other Obstructions	Conduit crossing and bridge.

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

No correspondence concerning Congdon Dam could be located. One inspection report, consisting of a State of Connecticut inventory sheet, is located at:

State of Connecticut
Department of Environmental Protection
State Office Building
165 Capitol Avenue
Hartford, Connecticut 06115
Attention: Mr. Victor J. Galgowski,
Dam Safety Engineer

One plan was available from the Owner at:

Congdon Moving and Storage Co., Inc.
Oakdale Road, Route 163
Montville, Connecticut 06353

APPENDIX B-2

SELECTED COPIES OF PAST INSPECTION REPORTS

No. MV-18

Inventoried By LWPS

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

1

CT-234

Date 4 NOVEMBER 1964

Name of Dam or Pond Congdon Dam

Code No. T 9.4 OR 1.3

Nearest Street Location ROUTE 163

Town MONTVILLE Long 72-07.3

U.S.G.S. Quad. UNCASVILLE Lat 41-26.6 nr 1/73

Name of Stream OXOBOXO BROOK

Owner ~~RICHARD POPE~~ Congdon Mowing & Storage

Address ~~Box 565~~ 513 Main St.

~~NORWICH~~ Norwich 889-8467

ok 12/78

Pond Used For NOTHING- DA 1.70 SM

Dimensions of Pond: Width 200 FEET Length 900 FEET Area 5 ACRES

Total Length of Dam ~~75~~ 128 FEET Length of Spillway 35 FEET

Location of Spillway NORTH END OF DAM

Height of Pond Above Stream Bed 31 ~~40~~ FEET

Height of Embankment Above Spillway 5 FEET

Type of Spillway Construction MASONRY, CONCRETE CAP

Type of Dike Construction MASONRY, EARTH CORE

Downstream Conditions CULVERT UNDER CONNECTICUT TURNPIKE

Summary of File Data LETTER FROM OWNER DATED 2-9-63 REQUESTING INSPECTION.

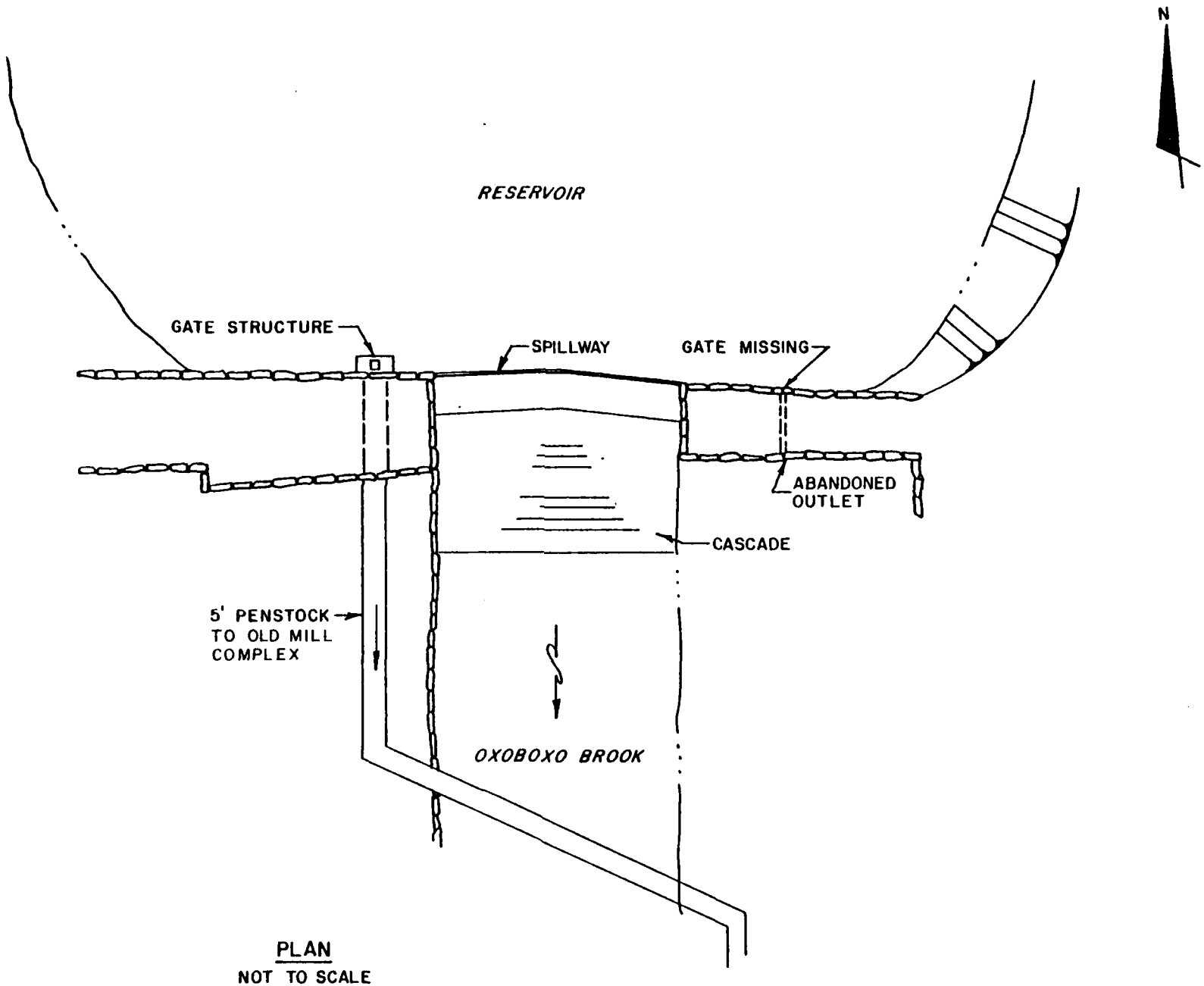
Remarks BRUSH GROWING ON DIKE

100?

Would Failure Cause Damage? YES Class B

APPENDIX B-3

PLANS, SECTIONS AND DETAILS

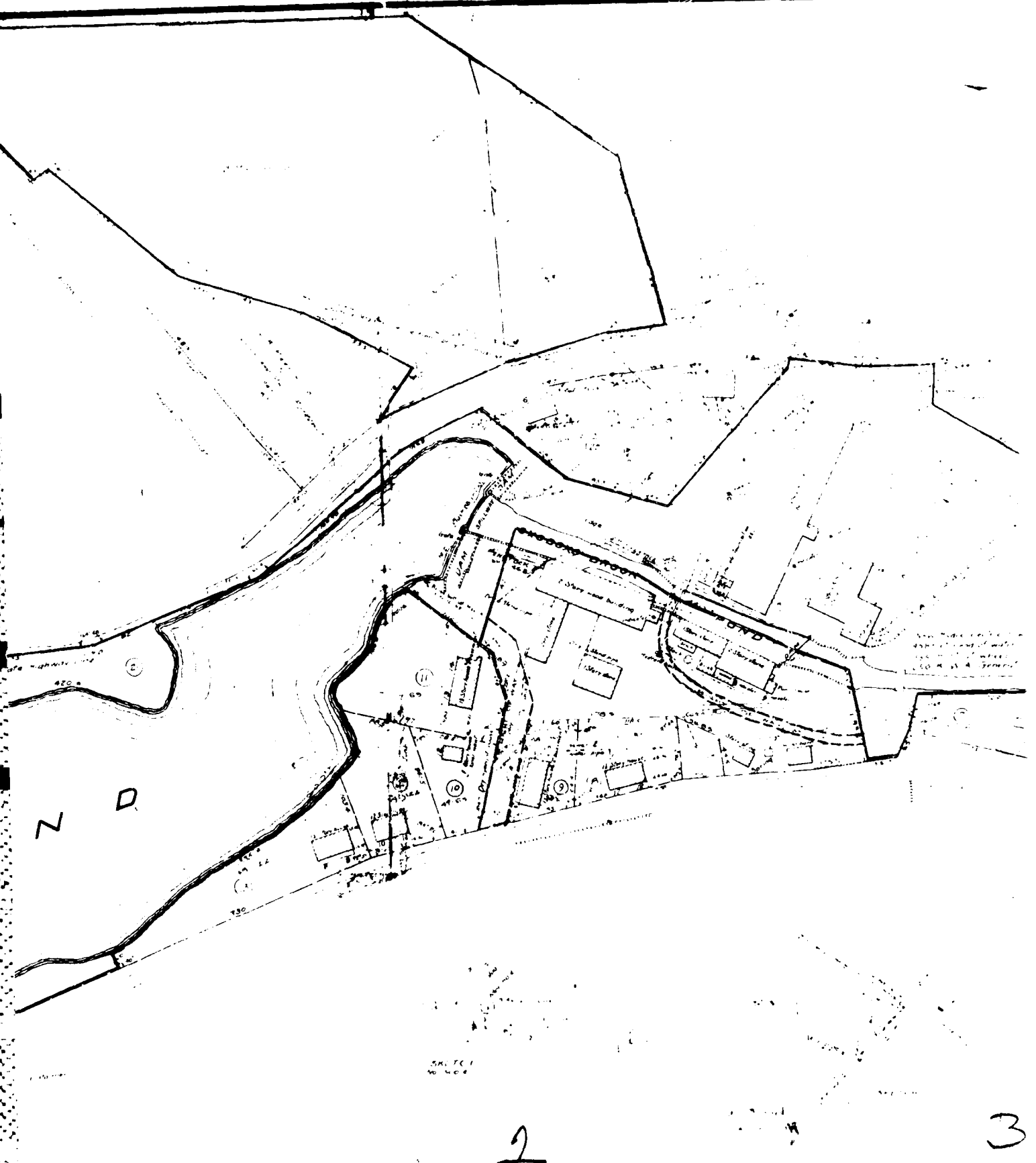


PLAN OF DAM
CONGDON DAM

PLAN
NOT TO SCALE

PLATE B-1


P O N
DARROW ROAD


N D

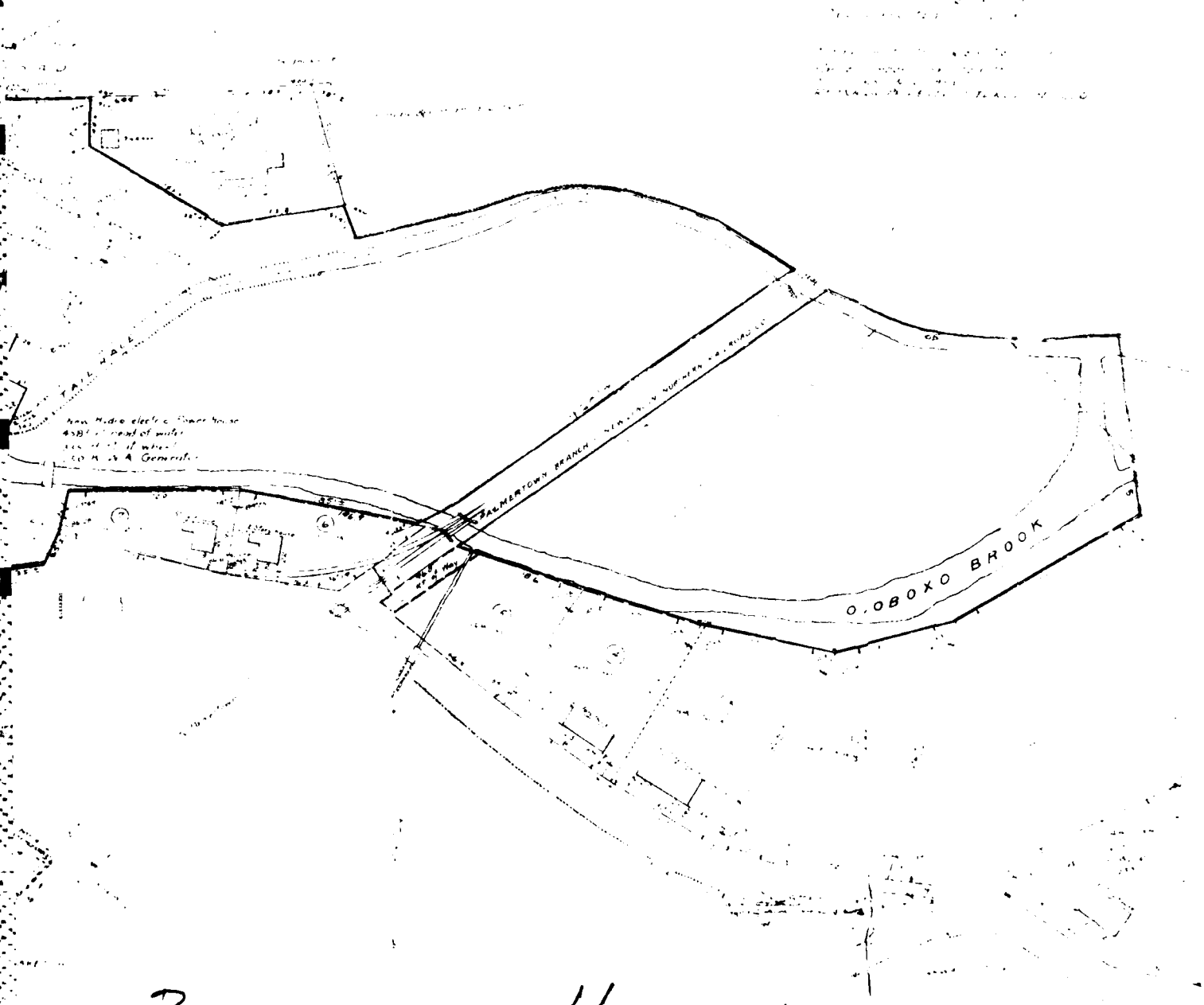
PLAN OF THE

PEQUOT MILL PROPER

AT MONTVILLE CON

THE J.B. MARTIN

1919



3 4

PLAN OF THE

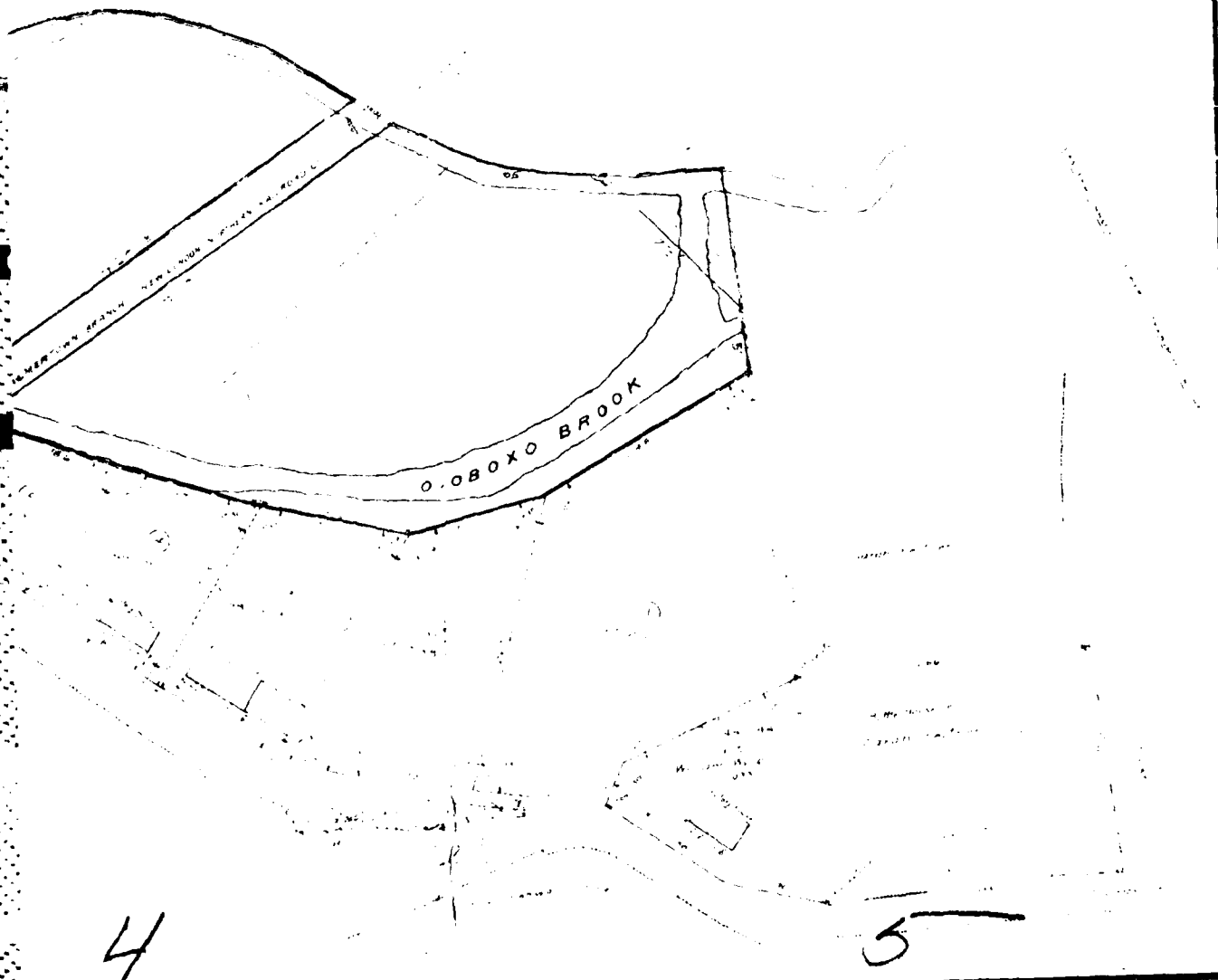
PEQUOT MILL PROPERTY.

AT MONTVILLE, CONN.

OWNED BY

THE J. B. MARTIN CO.

1919



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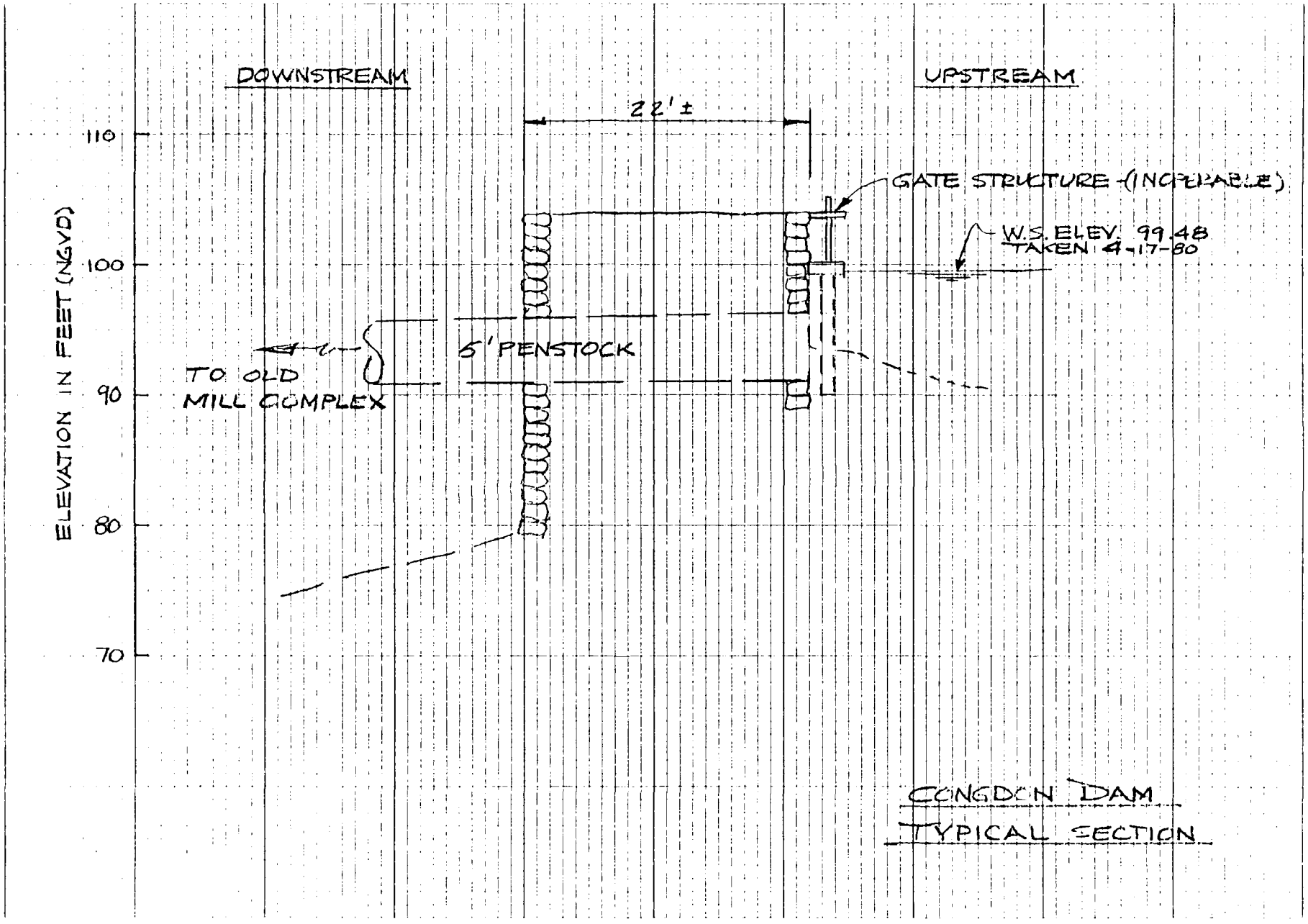


CONGDON DAM
TYPICAL SECTION

APPENDIX C

PHOTOGRAPHS

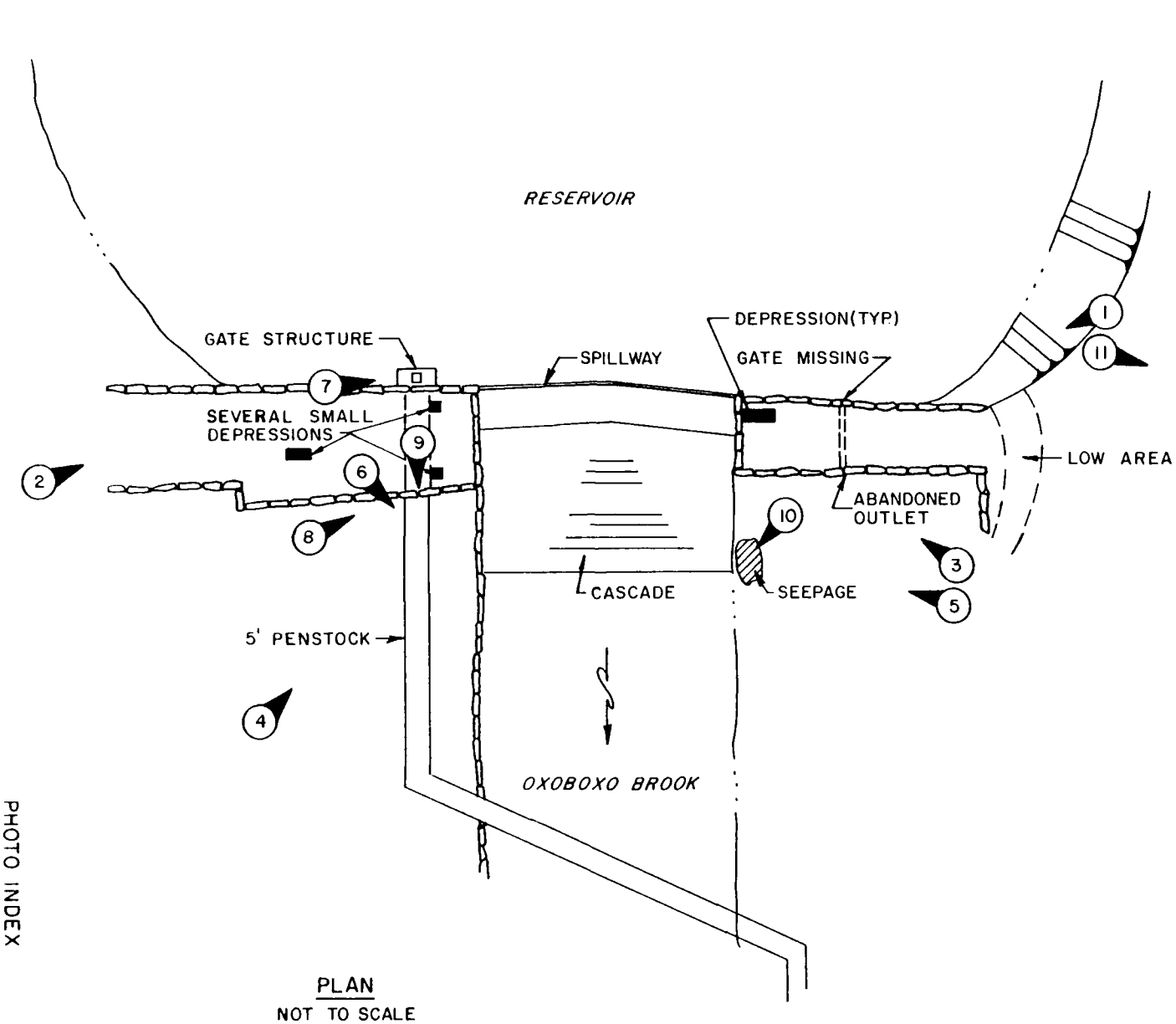


PHOTO INDEX
CONGDON DAM

PLAN
NOT TO SCALE

PHOTO C-1 Upstream face of dam from left side.

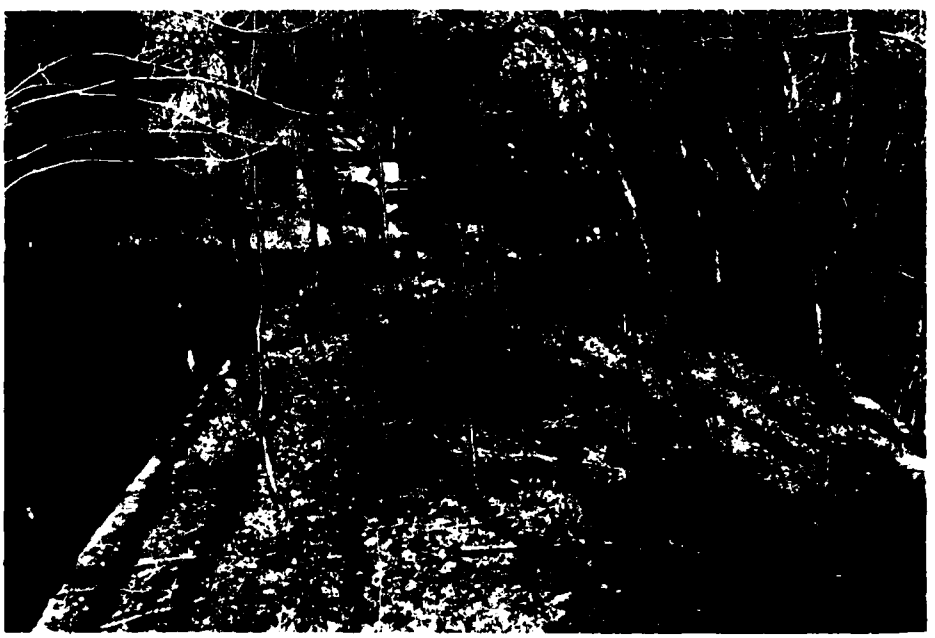


PHOTO C-2 Crest of dam from right abutment.

PHOTO C-3 Downstream face of dam from left side.

PHOTO C-4 Downstream face of dam and spillway from right side.

PHOTO C-5 Spillway and abutments from left side.

PHOTO C-6 Downstream channel and penstock from crest of dam, right side.

PHOTO C-7 Outlet gate mechanism.

PHOTO C-8 Penstock at downstream face of dam.

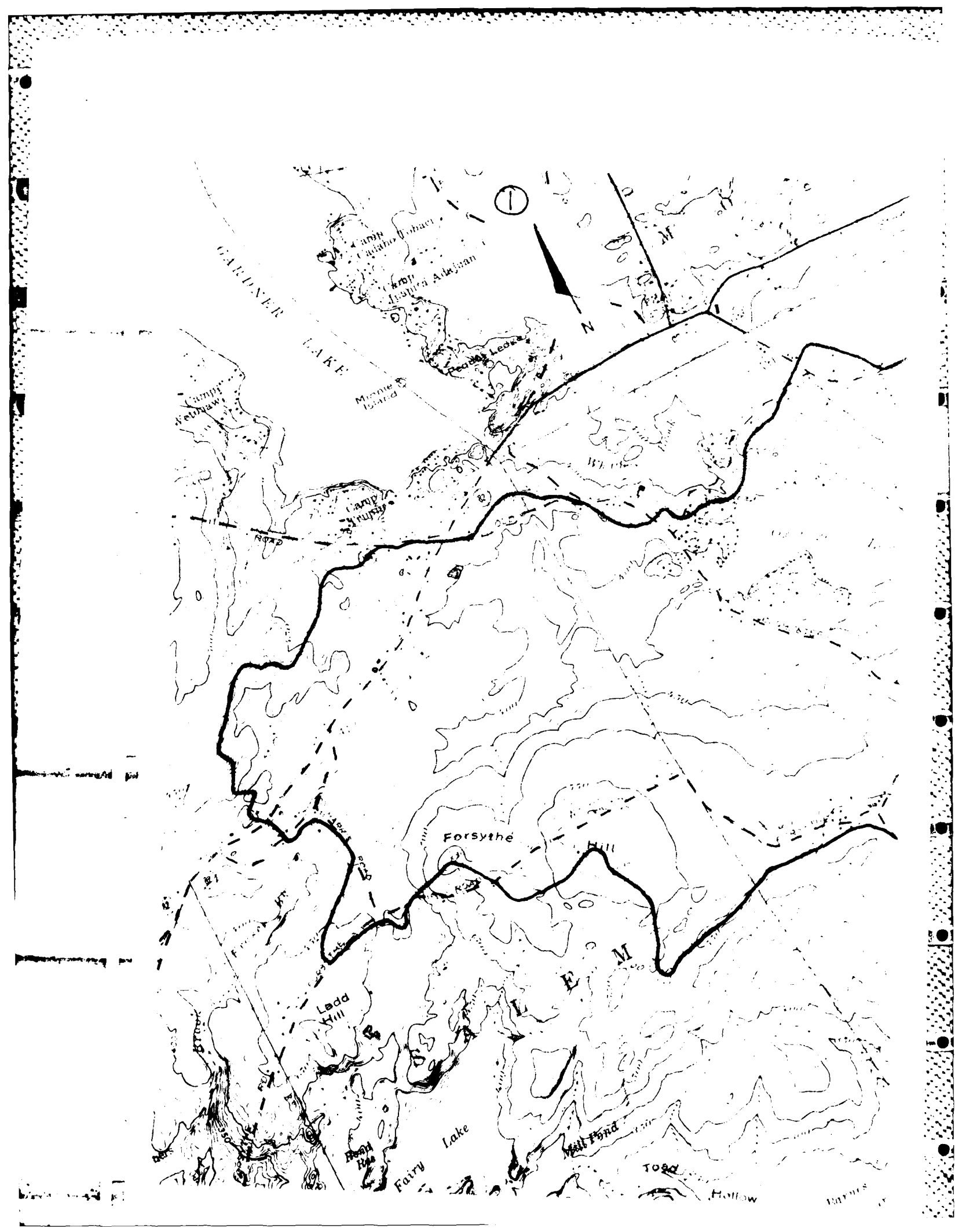
PHOTO C-9 Top of penstock at downstream face of dam.

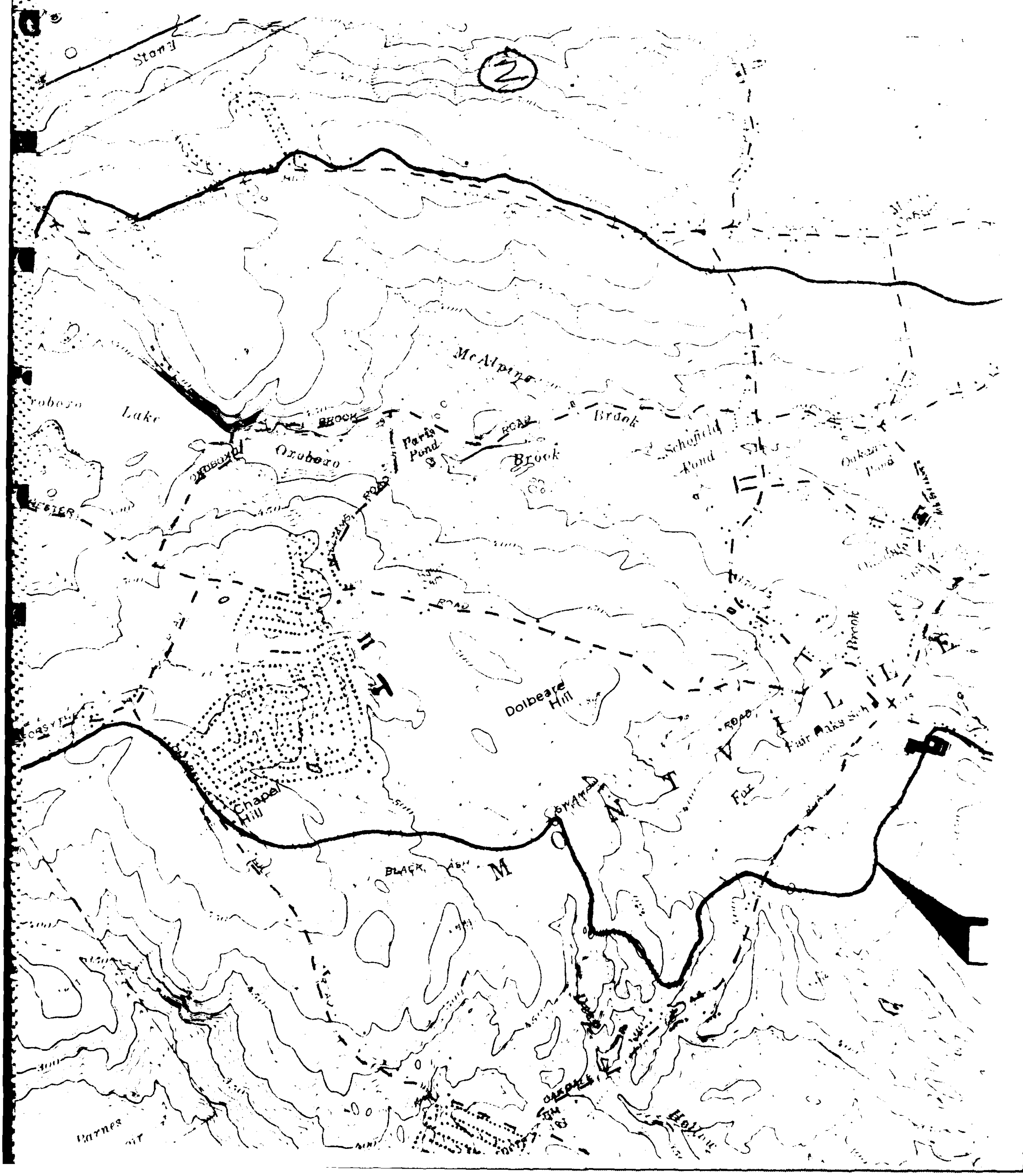
PHOTO C-10 Seepage area downstream of dam embankment, left side.

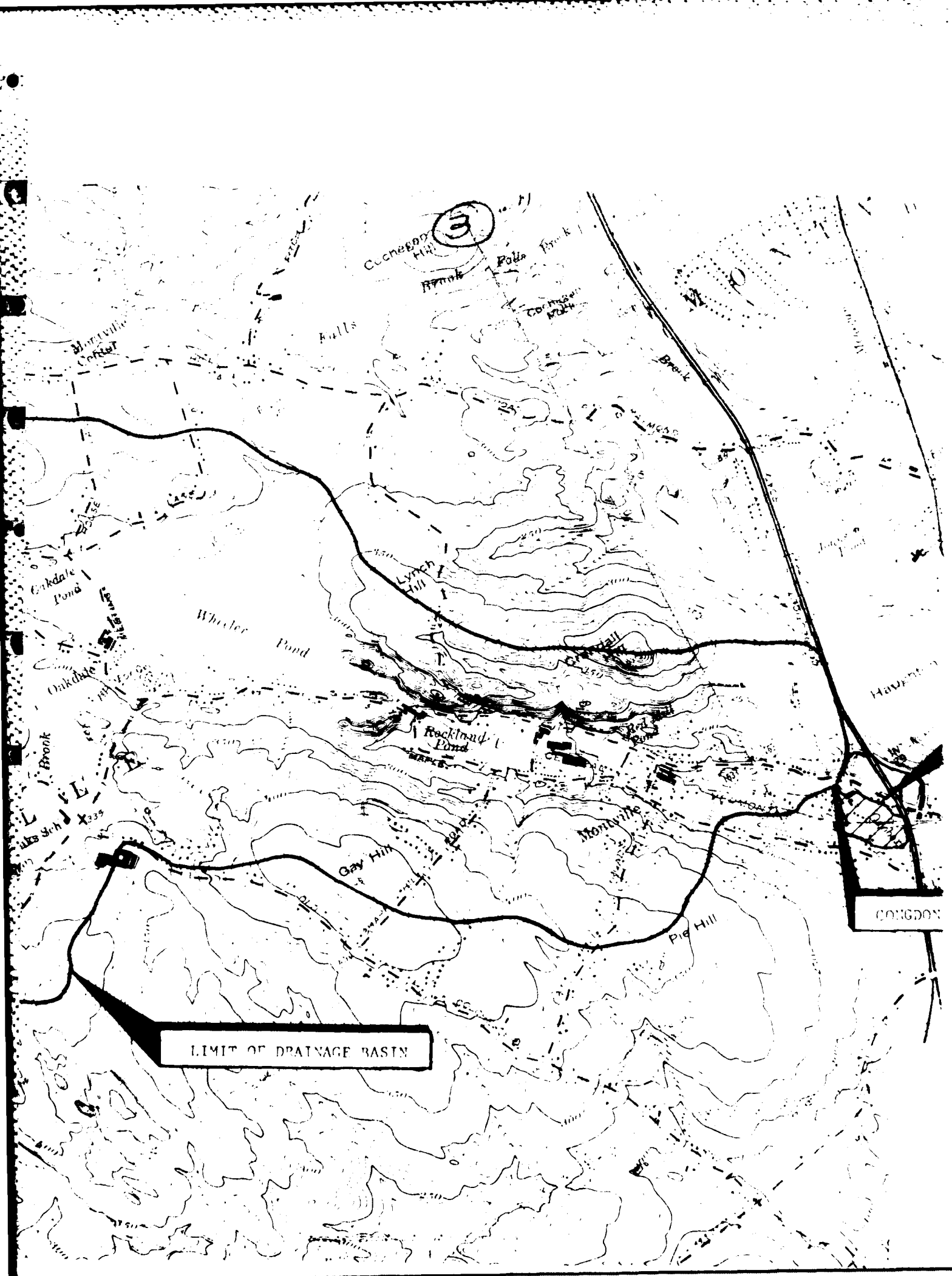
PHOTO C-11 Low area at left abutment of dam.

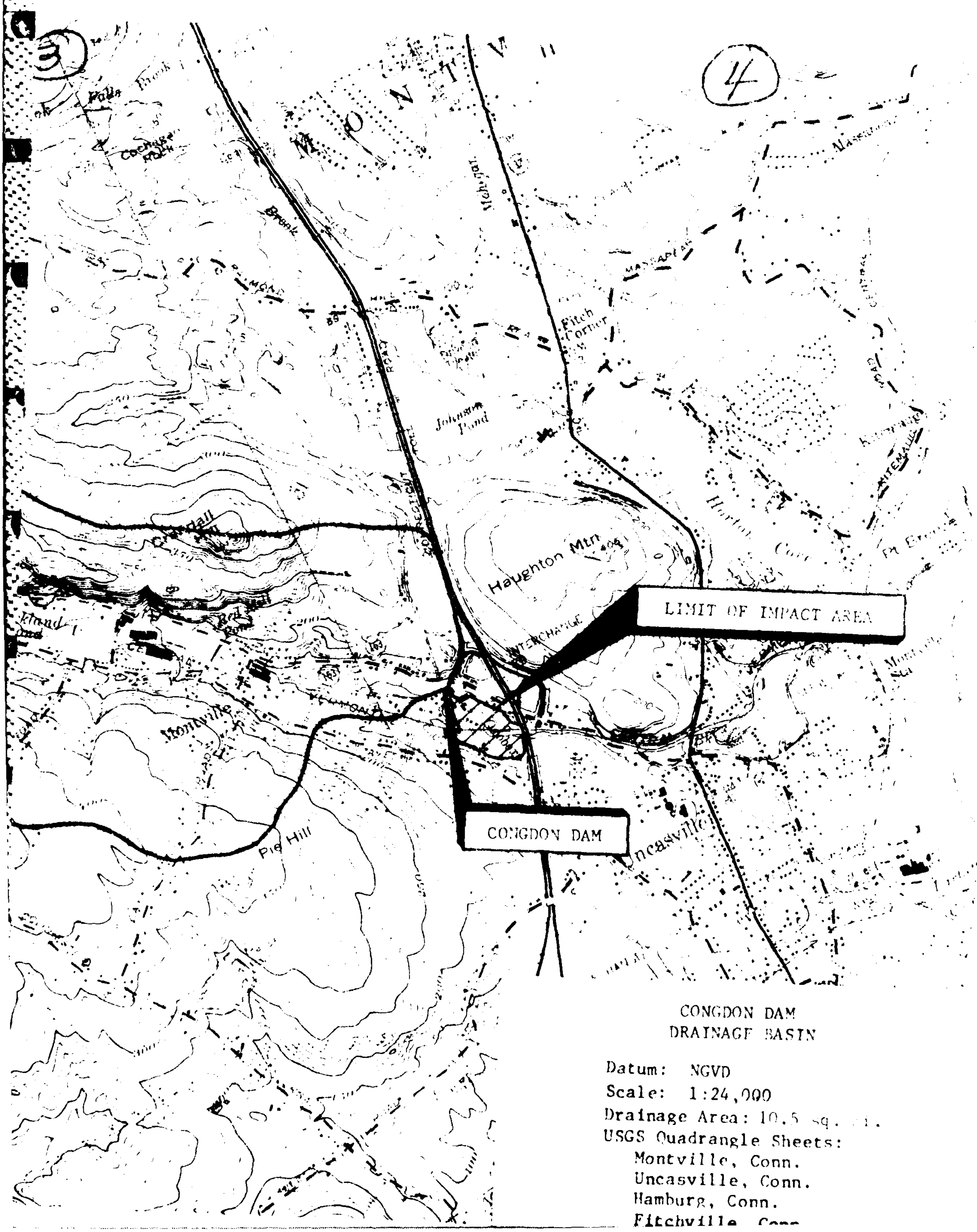
APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS


Camp Kenbraw
Minnie Island
Forsythe
Hill
Lake
Mill Pond
Hollow


2
Stony
McAlpine
Oxboro
Lake
BROOK
Parks Pond
ROAD
Brook
Brook
Schofield Pond
Oakdale Pond
Oxboro
ROAD
Dolbeare Hill
ROAD
Fair Oaks Sch
Fox
Chapel Hill
BLACK ASH
M
Hollow
Barnes


Cuchebogue Hill
Falls Brook
Falls
Brook
Lynch Hill
Wheeler Pond
Oakdale Pond
Oakdale
Rockland Pond
Brook
Gay Hill
Pig Hill
Monroe
COLCHESTER
LIMIT OF DRAINAGE BASIN



CONGDON DAM
DRAINAGE BASIN

Datum: NGVD
Scale: 1:24,000
Drainage Area: 10.5 sq. mi.
USGS Quadrangle Sheets:
Montville, Conn.
Uncasville, Conn.
Hamburg, Conn.
Fitchville, Conn.

A. Size Classification Congdon Dam

Height of dam = 35 ft.; hence Small

Storage capacity at top of dam (elev. 105.0) = 135 AC-FT.; hence Small

Adopted size classification SMALL

B. Hazard Potential

This dam is classified as a SIGNIFICANT hazard potential structure because it is located in a predominantly suburban area where failure could result in the loss of a few lives and damage to 7-10 dwellings and 1-3 commercial properties. Flooding and potential damage may also occur to Darrow Road as well as the public utilities located within the right of way of the roadway. Damage may also occur to a double barrelled concrete arch bridge, located 260 feet downstream from the dam.

C. Adopted Classifications

HAZARD	SIZE	TEST FLOOD RANGE
SIGNIFICANT	SMALL	100 year to Half PMF

Adopted Test Flood = Half PMF = 750 CSM

= 7875 CFS

D. Overtopping Potential

Drainage Area = 10.5 sq. miles

Spillway crest elevation = 99.0 NGVD

Top of Dam Elevation = 104.0 NGVD

Maximum spillway discharge Capacity without overtopping of dam = 1845 CFS

"test flood" inflow discharge = 7875 CFS

"test flood" outflow discharge = 7775 CFS

% of "test flood" overflow carried by spillway without overtopping = 24%

"test flood" outflow discharge portion which overflows over the dam = 5930 CFS

% of test flood which overflows over the dam = 76%

Estimating Maximum Probable Discharges - Inflow and Outflow Values Date of Inspection: April 17, 1980

Name of Dam Congdon Dam ; Location of Dam Oxoboxo Brook ; Town Uncasville, CT

Watershed Characterization Rolling terrain; swampy; moderate to flat slopes ; 1.05 sq. miles of drainage area is swampy or occupied by storage reservoirs

Adopted "test" flood = Half PMF = 750 CSM = 7875 CFS; Re = Effective Rainfall = 9.5 inches

D.A. = Drainage Area (Gross) = 10.50 Square Miles; Basin Slope = 0.03 hence; Flat to moderate

S.A. = Surface Area of Reservoir = 0.011 Square Miles; Time of Concentration = more than 30 minutes

Shape and Type of Spillway = Overflow, free vertical fall sharp crested weir

B = Width of Spillway = 50 feet; C = Coefficient of Discharge = (3.33 - Friction) = 3.30

Maximum Capacity of Spillway Without Overtopping = 1845 CFS = 24 % of test flood

Top of Dam Elevation = 104.0; Spillway Crest Elevation = 99.0

Overflow portion of Length of Dam = 150 ft. ; C = Coefficient of discharge for Dam = 3.0

Name of Dam	Test Flood Q_p		Inflow Characteristics		Outflow Characteristics First Approximation			Outflow Characteristics Second Approximation			Outflow Characteristics Third Approximation (Adopted)		
	CSM	CFS	h_0 in feet	S_0 in in.	Q_{p1} CFS	h_1 in ft.	S_1 in in.	S_2 in in.	h_2 in ft.	Q_{p2} CFS	S_3 in in.	h_3 in ft.	Q_{p3} CFS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Congdon Dam	1/2 PMF = 750	7875	13.12	0.165	-	SEE	PLATE	D-11	-	-	0.1187	9.5	7775

Q_p = Discharge; h= Surcharge height; S = Storage in inches NOTE: Outflow discharge values are computed as per COE guidelines.

NAME OF DAM: CONGDON DAM

ESTIMATING EFFECT OF SURCHARGE STORAGE ON "TEST FLOOD"

A. This routing of floods through the reservoir was carried out according to the guidelines established by the Corps of Engineers in Phase 1 Inspection for Dam Safety Investigations issued in March, 1978.

B. Formulas used are as follows:

i. For no overtopping: $Q = C_1 B_1 h_1^{3/2}$
For overtopping: $Q = C_1 B_1 [h_2 + F.B.]^{3/2} + C_2 B_2 h_2^{3/2}$
For open channel flow: N/A
For orifice flow: N/A

where C_1 = coefficient of discharge for spillway; B_1 = length of spillway
C_2 = coefficient of discharge for dam; B_2 = length of dam
h_1 = head over spillway crest (feet); h_2 = head over dam (feet)
F.B. = distance between spillway crest and top of dam

ii. Surcharge storage in inches = $S = 12 (h_1 + h_2) \frac{S.A.}{D.A.} = 0.0126h$
where S.A. = surface area and
D.A. = drainage area in sq. miles

iii. $Q_{outflow} = Q_{inflow} (1 - \frac{S}{Re})$; where Re = effective rainfall = 9.5"

iv. Length of dam = 100 ft. ; Top of Dam elev. = 104.0 ; c for dam = 3.0
Length of spillway = 50 ft. ; Spillway crest el. 99.0 ; c for spillway = 3.3

$Q = 3.3 \times 50 (h_2 + 5)^{1.5} + 3.0 \times 100 h_2^{1.5}$ where h_2 is head over top of dam

S = Storage in inches = $12h \frac{S.A.}{D.A} = 0.0126h$ where h is head over spillway crest

v. Q_{inflow} = 7875 C.F.S.

Q in CFS	Elevation	Total Head over crest $h_1 + h_2 = h$	Storage in inches = S	Remarks
7844	102	3	.025	
7822	104	5	.05	
7800	106	7	.075	
7780	108	9	0.100	
7760	110	11	0.125	
7775	108.5	9.5	0.11875	

"Rule of Thumb Guidance for Estimating
Downstream Dam Failure Discharge"

BASIC DATA

Name of dam Congdon Dam Name of town Uncasville, CT

Drainage area = 10.5 sq. mi., Top of dam 104.0 NGVD

Spillway type = Free overflow, sharp crest Crest of spillway 99.0 NGVD

Surface area at crest elevation = 7 acres = 0.011 sq. mi.

Reservoir bottom near dam = 69.0 NGVD

Assumed side slopes of embankments Vertical

Depth of reservoir at dam site 35.0 = y_o = 35.0 ft.

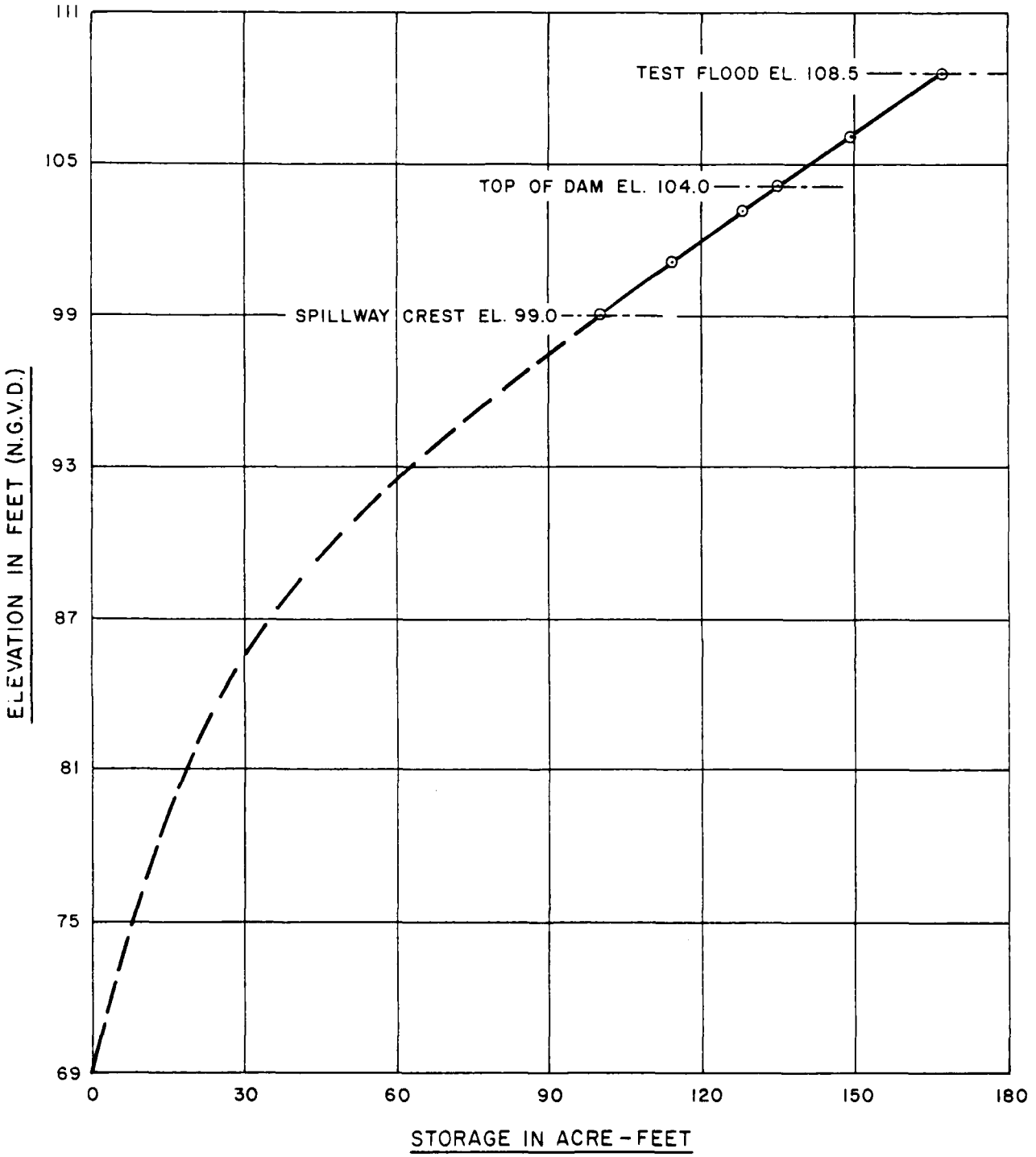
Mid-height elevation of dam = 87.0 NGVD

Length of dam at crest = 150 ft.

Length of dam at mid-height = 115 ft.

20% of dam length at mid-height = W_b = 23 ft.

Elevation (NGVD)	Estimated Storage in AC-FT	
99.0	100	Spillway Crest Elevation
101.0	114	
103.0	128	
104.0	135	Top of Dam Elevation
106.0	149	
108.5	167	Test Flood Elevation



STORAGE-ELEVATION CURVE
CONGDON DAM

PLATE D-6

CONGDON DAM

i. DAM FAILURE ANALYSIS

A. Failure Analysis

Discharge $= \frac{8}{27} W_B \sqrt{g}\, y_o^{1.5}$

$= 1.68\, W_B\, y_o^{1.5}$

$= 8000$ C.F.S.

C.F.S.

B. Maximum Spillway

Discharge with W.S.E.

At top of Dam @ 104.0 — 1845 C.F.S.

C. Total Dam Failure Discharge — 9845 C.F.S.

D. Reservoir - Storage Data:

Volume of storage at spillway crest = 100 AC-ft. @ Elev. 99.0

Surcharge storage at top of dam = 35 AC-ft. @ Elev. 104.0

Storage Total = 135 AC-ft. @ Elev. 104.0

E. Flood Discharge Channel

i. Maximum depth of flow just D/S of Dam = $\frac{4}{9} y_o$ = 15.6 feet

Notes:

1. Failure of dam is assumed to be instantaneous. When pool reaches top of dam, and is a full-depth partial width rectangular shape failure with a width of failure = W = 23 feet and depth of failure y_o = ~~_____~~ 35 feet.

2. Steady, uniform flow phenomenon is assumed for determination of failure profile and is based on Manning's formulae.

3. Failure profile for impacted area determination is determined at one typical cross section in the downstream channel. Reduction in discharge due to available storage has been taken into account.

ii. Reach 1

Length = 1500 feet; Station 0 to Station 15+00; n = 0.05

Bed slope = $S_o \simeq S_f$ = 0.002; Bed width = b = 136 feet

Bed width is scaled from U.S.G.S. map; scale 1" = 2,000 feet

As bed width is large and 1" = 2,000 feet and 10-foot contour interval scale maps are being used for various channel parameters, it is appropriate to assume that d = R = Hyd Radius = depth, hense Manning's formulae is transformed:

$$Q = A \frac{1.49}{n} R^{2/3} \sqrt{S} = ba \frac{1.49}{n} d^{2/3} \sqrt{S}$$

$$Q = b \frac{1.49}{n} \sqrt{S}\, d^{5/3} = Kd^{5/3} = 181 d^{5/3}$$

State Discharge Relationship for Reach 1

Depth = d in Feet	Stage of Elevation	Discharge in CFS = Q	Velocity in ft./sec.	Storage Volume in AC-ft. = V
0	67.5	0	0	0
2	69.5	574	2.11	9.6
4	71.5	1823	3.35	18.8
6	73.5	3582	4.39	28.2
8	75.5	5784	5.32	37.6
10	77.5	8388	6.17	47.0
12	79.5	11365	6.96	56.4

F. Water surface profiles resulting from maximum spillway discharge and also from dam failure discharge are shown on Plate D-11 for comparison purposes. This figure also shows the rise in water depth due to failure of dam.

Also, Discharge -- Depth and Storage-depth curves are shown on Plate D-12 for downstream channel.

Notes: 1. Storage volume in AC-ft = $\frac{\text{(Length of Reach) (Bed Width) (Depth)}}{43{,}560}$

2. Failure discharge being large will mostly be overbank flow on existing channel.

G. For Q_1 = 9845 CFS; depth = 11.0 ft. V_1 = 51.7 AC-ft.

Trial $Q_2 = Q_1 \left(1 - \frac{V_1}{\text{Storage}}\right) = Q_1 \left(1 - \frac{51.7}{135}\right)$ = 6075 CFS

$\therefore V_2$ = 40 AC-ft.

Avg $V = \frac{V_1 + V_2}{2}$ = 45.9 AC-ft.

$\therefore Q_2 = Q_1 \left(1 - \frac{V \text{ Avg.}}{\text{Storage}}\right)$ = 6500 CFS; y_2 = 8.4 ft.

Depth at center of flood as adopted = 9.7 ft.

Additional dam failure analysis beyond Reach 1 has not been undertaken because the depth of flow of 9.7 feet at the end of Reach 1 will not cause any hazardous conditions further downstream. The failure discharge and depth will continually decrease beyond Reach 1, However almost total impacted area due to failure of dam is shown on Plate D-11. No significant damages in life and/or property are anticipated beyond Reach 1 because no houses, roads or establishments are located below the anticipated depths beyond Reach 1 of 1500 feet.

SUMMARIZED AND ADOPTED VALUES

FOR

DAM FAILURE ANALYSIS

i. Name of Dam CONGDON DAM

ii. Dam Failure Discharge _____ = 8000 cfs.

iii. Maximum Spillway Discharge _____ = 1845 cfs.

iv. Total Dam Failure Discharge _____ = 9845 cfs.

v. Normal (Manning Depth) for 9845 = 11.0 feet

vi. Normal (Manning Depth) for 1845 = 4.0 feet

vii. Increase in depth due to failure of dam = 7.0 feet

viii. W.S.E. prior to failure = Ground Elevation + 4.0

ix. W.S.E. after failure = Ground Elevation + 11.0

Note: The adopted depth of flow values are assumed to be accurate representations of damages in the impacted areas. Professional judgement is used in these final adopted values.

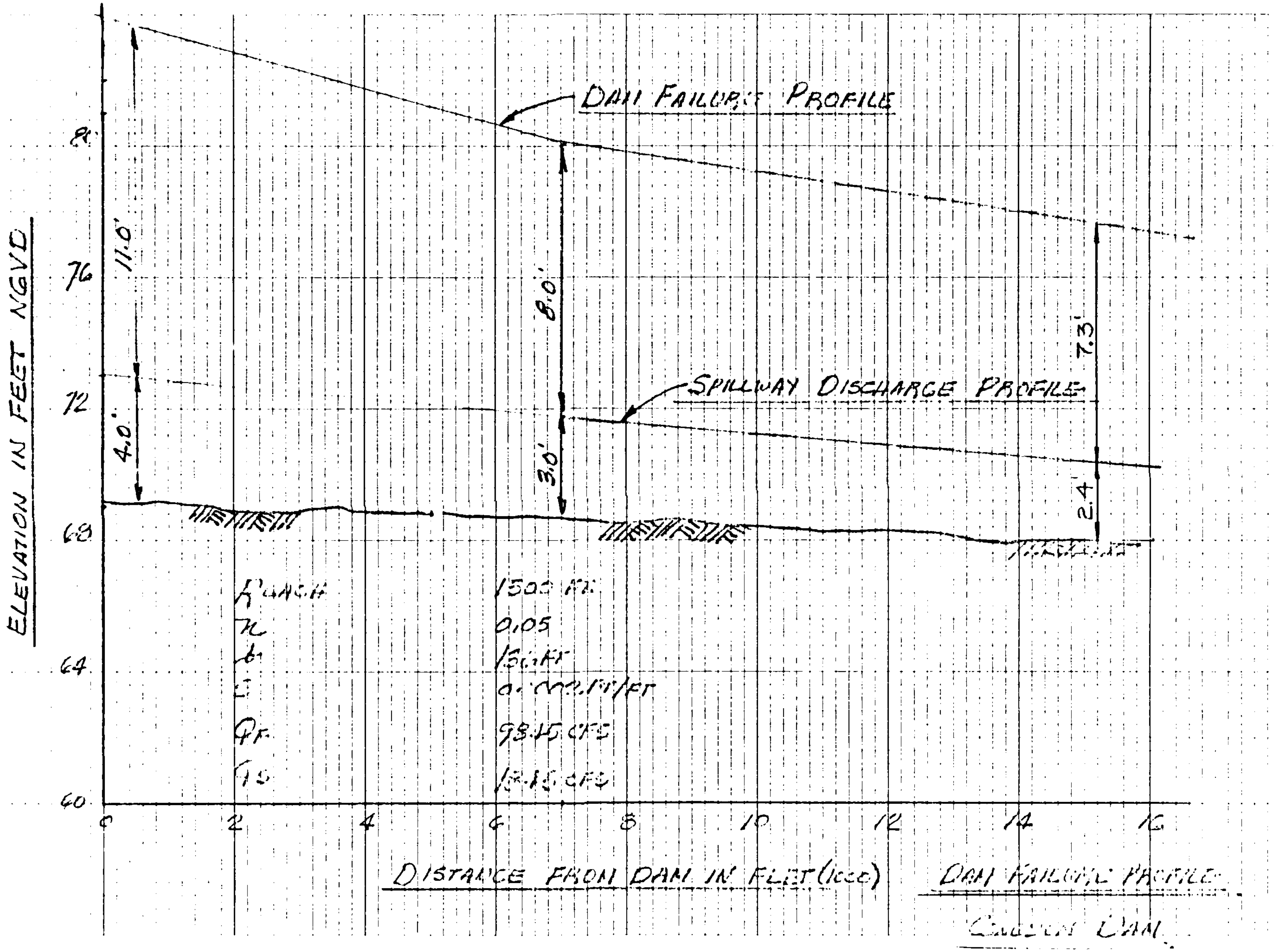
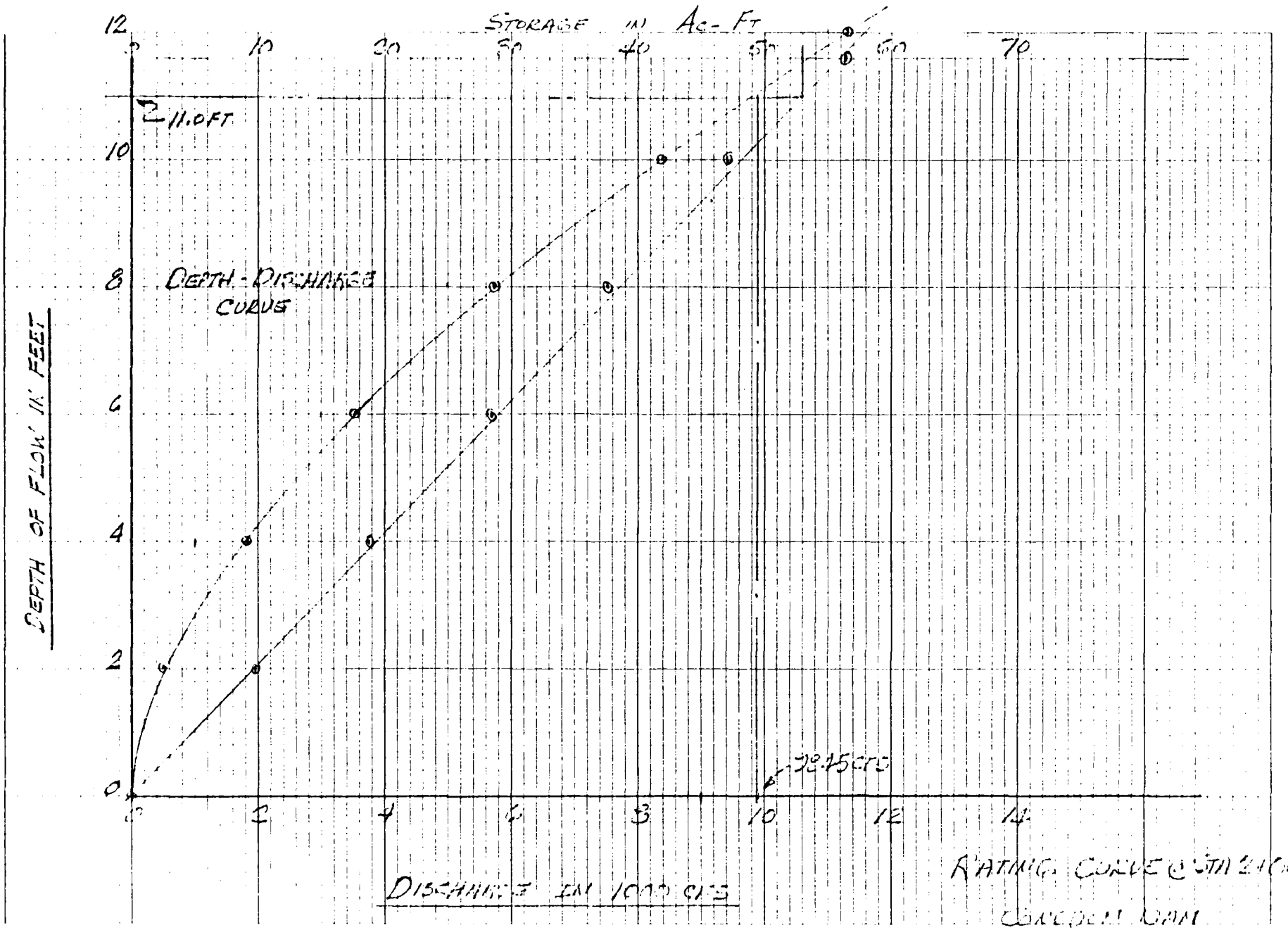

DAM FAILURE PROFILE
SPILLWAY DISCHARGE PROFILE
11.0'
4.0'
8.0'
3.0'
7.3'
2.4'
ELEVATION IN FEET NGVD
80
76
72
68
64
60
0
2
4
6
8
10
12
14
16
n
0.05
QF
9845 CFS
DISTANCE FROM DAM IN FEET
DAM FAILURE PROFILE
DAM

PLATE C-11


STORAGE IN AC-FT
11.0 FT
DEPTH - DISCHARGE CURVE
DEPTH OF FLOW IN FEET
DISCHARGE IN 1000 CFS
12.15 CFS
RATING CURVE

Congdon Dam

COMPUTATIONS FOR
SPILLWAY RATING CURVE AND
OUTLET RATING CURVE COMPUTATIONS

Spillway width = 50 feet; Spillway crest elevation = 99.0 NGVD

Length of dam = 150 feet; Top of dam elevation = 104.0 NGVD

C = 3.3 for spillway ; 3.0 for dam

i) SPILLWAY RATING CURVE COMPUTATIONS

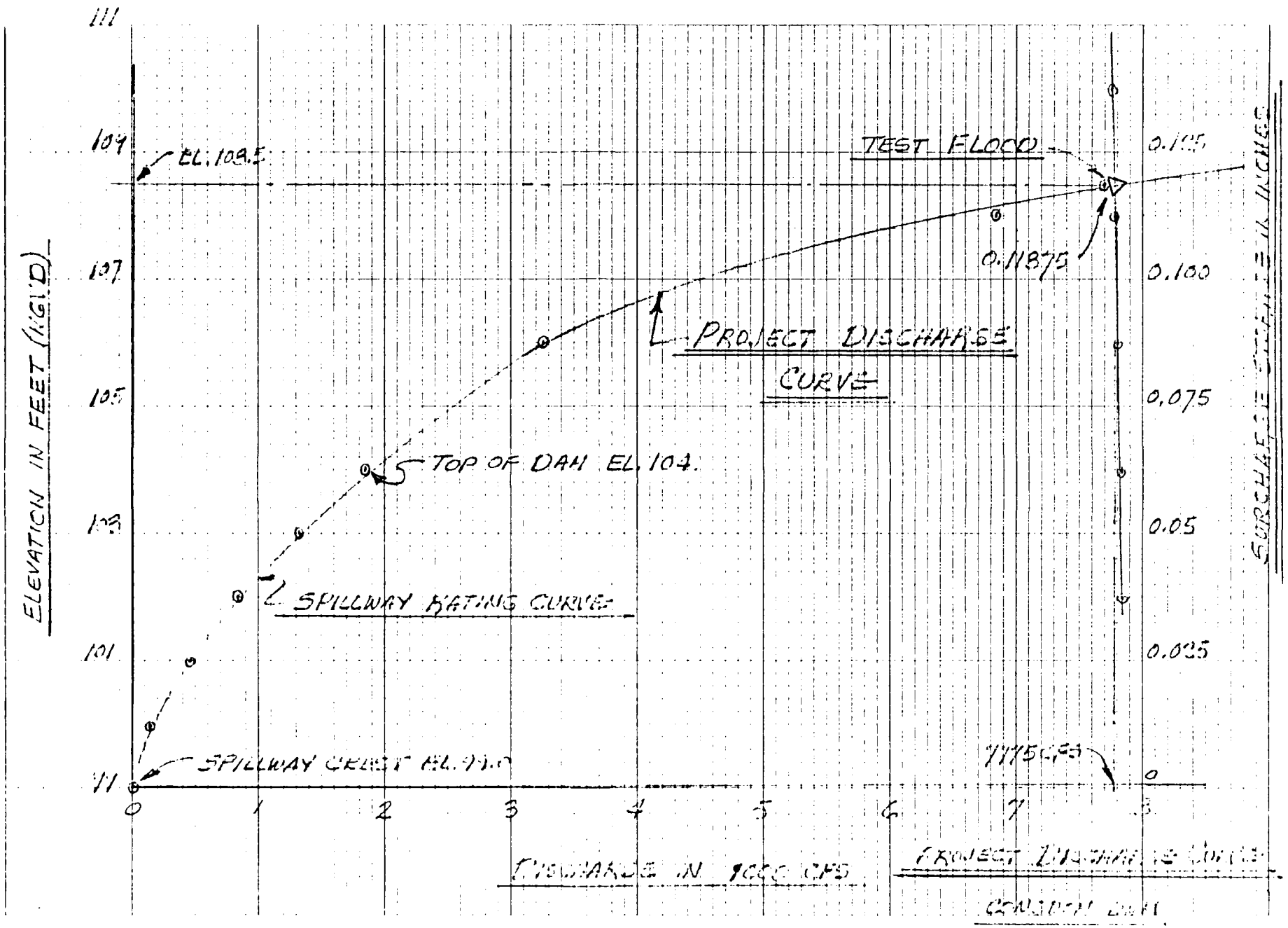
Elevation (ft.) NGVD	Spillway Discharge (CFS)	Remarks
99.0	0	Spillway Crest Elevation
100.0	165	
101.0	466.9 ≈ 467	
102.0	857	
103.0	1320	
104.0	1845	Top of Dam Elevation
106.0	3273	
108.0	6855	
108.5	7695	Test Flood Elevation

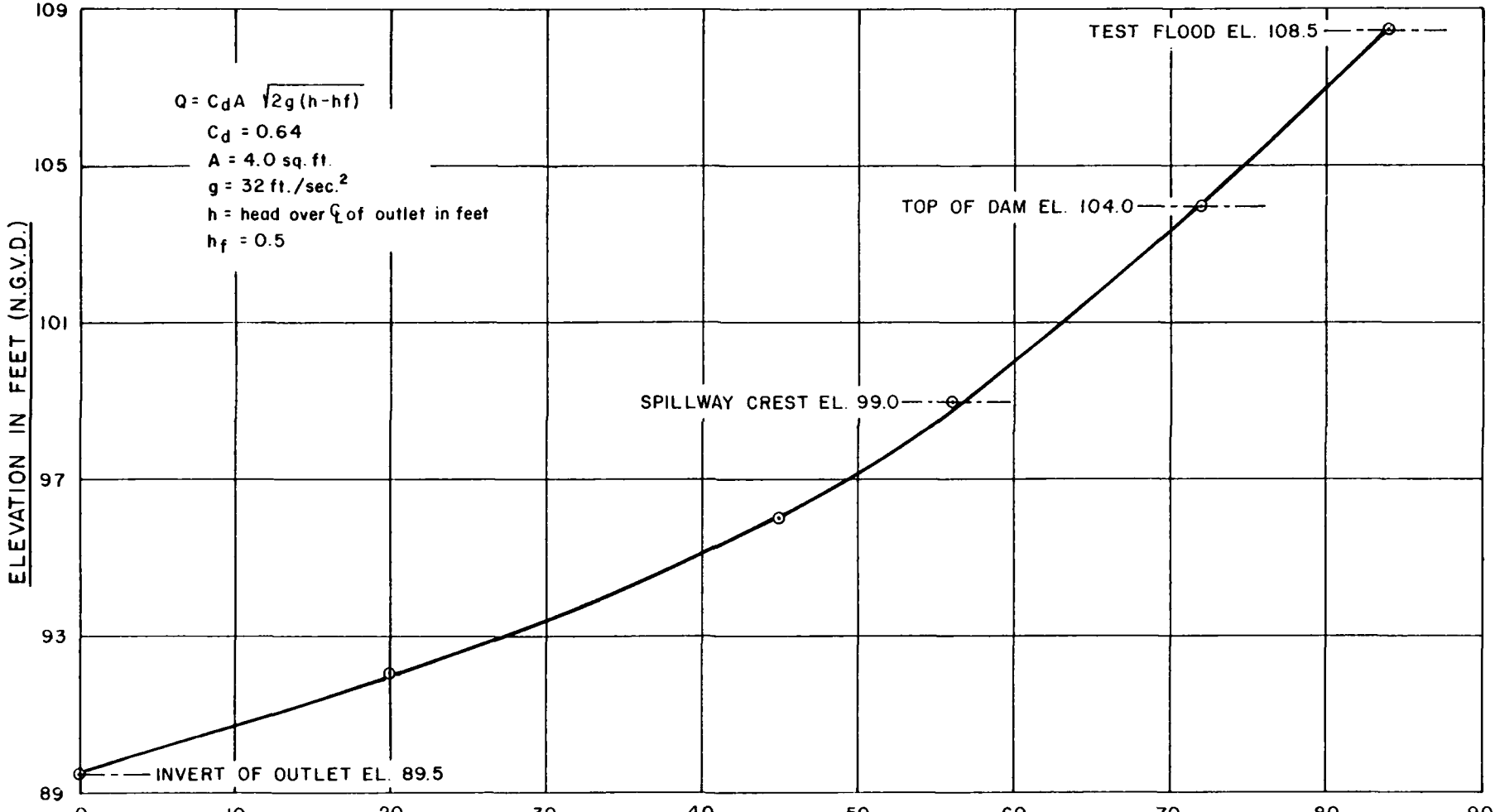
ii) OUTLET RATING CURVE COMPUTATIONS (Abandoned and inoperable)

Elevation (ft.) NGVD	Discharge (CFS)	Remarks
89.5	0	Invert of Outlet
92.0	20	
96.0	45	
99.0	56	Spillway Crest Elevation
104.0	72	Top of Dam Elevation
108.5	84	Test Flood Elevation

Size of outlet = 2'x2' (estimated); Area of outlet = 4.0 sq. ft.

Invert of outlet = 89.5 ; Center line of outlet = 90.5


ELEVATION IN FEET (N.G.V.D.)
111
109
107
105
103
101
EL. 109.5
TEST FLOOD
0.1875
PROJECT DISCHARGE CURVE
TOP OF DAM EL. 104.
SPILLWAY RATING CURVE
SPILLWAY CREST EL. 99.0
0
1
2
3
4
5
6
7
8
0.125
0.100
0.075
0.05
0.025
0
SURCHARGE STORAGE IN INCHES
DISCHARGE IN 1000 CFS
PROJECT DISCHARGE CURVE
CONSIDERED DAM



(LEFT EMBANKMENT OUTLET)

OUTLET RATING CURVE

CONGDON DAM

PLATE D-15

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	(FEDERAL NUMBER)	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
CT	[illegible]	NEC	CT	011	02				CONGDON DAM	4126.6	7207.3			

POPULAR NAME	NAME OF IMPOUNDMENT
	OXOBORO BROOK

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	10	OXOBORO BROOK	UNCASVILLE	1	5000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
PORE	1900	R	35	35	135	100	NED	N	N	N	Y	

REMARKS

D/S HAS	SPILLWAY LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
2	150	J	50	1845												

OWNER	ENGINEERING BY	CONSTRUCTION BY
CONGDON MOVING & STORAGE		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
CE MAGUIRE INC	15	APR	80	PL 92-367

REMARKS